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Establishing a Selected Reserve corporate database

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THESIS

ESTABLISHING A SELECTED RESERVE
CORPORATE DATABASE

by

LCDR Sherry R. Newton

March, 1990

Thesis Advisor:	LCDR Robert Knight

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The Director of Naval Reserve and Commander, Naval Resere Force (CNRF) are totally dependent on the Commanding Officer, Naval Reserve Personnel Center (NRPC) and the Inactive Manpower and Personnel Information System (IMAPMIS) automated information system for the control of all functions of Selected Reserve (SELRES) mobilization billet information, personnel billet assignments, personnel pay and tracking individual member retirement credit. Although recently converted from a flat file system to a relational database, IMAPMIS does not meet functional requirements for timely update and correction of critical data. IMAPMIS's poor responsiveness and lack of ad hoc query capability make it obsolete and virtually unusable for SELRES data. The purpose of this thesis is to examine the present functions of IMAPMIS and identify its shortfalls. This is followed by a recommended alternative to establish a separate SELRES database, administered by CNRF, that will internally process data and feed updated information to external systms such as IMAPMIS.

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Establishing a Selected Reserve
Corporate Database

by

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ABSTRACT

The Director of Naval Reserve and Commander, Naval Reserve Force (CNRF) are totally dependent on the Commanding Officer, Naval Reserve Personnel Center (NRPC) and the Inactive Manpower and Personnel Information System (IMAPMIS) automated information system for the control of all functions of Selected Reserve (SELRES) mobilization billet information, personnel billet assignments, personnel pay and tracking individual member retirement credit. Although recently converted from a flat file system to a relational database, IMAPMIS does not meet functional requirements for timely update and correction of critical data. IMAPMIS's poor responsiveness and lack of ad hoc query capability make it obsolete and virtually unusable for SELRES data. The purpose of this thesis is to examine the present functions of IMAPMIS and identify its shortfalls. This is followed by a recommended alternative to establish a separate SELRES database, administered by CNRF, that will internally process data and feed updated information to external systems such as IMAPMIS.

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I. INTRODUCTION

Since the beginning of automated data recording, Commander, Naval Military Personnel Command (NMPC) has been responsible for overall control of records, file systems, and databases that pertain to the personnel associated with the United States Navy. For active duty personnel, these files are maintained in Washington, DC by NMPC. For Naval Reserves, files are maintained under the jurisdiction of the Naval Reserve Personnel Center (NRPC) in New Orleans, LA. Thus, NRPC is responsible for:

1. maintaining up-to-date mobilization billets and individual member training assignments

2. overall data collection, record maintenance and updates for inactive naval reserve personnel

3. provide accurate participation/retirement point credit for inactive naval reserve personnel, and retirement point capture process

4. supply accurate drill and ACDUTRA participation and retirement data to the Naval Finance Center in Cleveland for Reserve pay matters, and

5. ensuring accurate, timely data is available for external sources and formal reports to the Congress, the Department of Defense as requested

The automated system that accounts for the maintenance, update and control of these records is the Inactive Reserve Manpower and Personnel Management Information System (IMAPMIS). IMAPMIS is the official source of all Inactive Reserve Personnel information and is central to all Naval Reserve components and applications.

Director of Naval Reserve (OP-095) and Commander, Naval Reserve Force (CNRF) are responsible for the training, preparedness and actual mobilization of the Selected Reserve. They are dependent on NRPC for accurate data input, corrections, timely updates and information flows that affect all aspects of Reserve personnel assets. Until recently, this reliance has been a mandated necessity since neither OP-095 nor CNRF has had the personnel or capability to maintain their own data. However, once a reservist's record has been established within IMAPMIS at NRPC, CNRF has historically assumed responsibility for collecting data for Selected Reserves. In August 1989, CNRF implemented a new automated database system that enables all 417 Naval Reserve activities to upload daily data transactions from their individual databases to a mainframe at CNRF in New Orleans, LA via

nightly telecommunication transmissions. With this new in-house mainframe data processing capability at CNRF and direct link to all field activities, it is now possible for CNRF to collect, automate and process data internally. Using standard built-in edit functions for format, range and acceptable parameters, data is verified immediately (Schwartz,1989,pp.49-50). Additionally, all data uploaded nightly to CNRF is processed on a daily basis and errors resulting from database inconsistencies are transmitted to the field for corrections the next working day. By affording the capability to collect and input data at its source, this provides a significant improvement in the timeliness and accuracy of data. Within IMAPMIS, errors that could take as much as sixty days to identify and resolve can now theoretically be corrected in one to two days.

In view of this recent capability at CNRF, the goal of this thesis is to address problems with IMAPMIS and examine issues concerning the feasibility of establishing a separate corporate database for the Selected Reserve, independent of, yet supportive to IMAPMIS. Chapter I presents the background and history of the current system and introduces some of the idiosyncrasies within the Naval Reserve. The second chapter provides a description of problems and shortfalls of existing data flow architectures, extensive data passing among systems, and how these factors impact on the Naval Reserve Force.

Chapter III describes policy issues and additional considerations that must be addressed before additional time and effort are expended for the improvement of IMAPMIS and chapter IV suggests an improved data flow architecture to support a separate Naval Reserve database independent of the present NRPC/NMPC database. Chapter V will provide conclusions and recommendations to further enhance the usefulness and quality of this independent database.

A. BACKGROUND

A first consideration to examining the scope and ramifications of this initiative requires a basic understanding of the organizational structure of the Selected Reserve. The Naval Reserve is comprised of personnel assets available to the Navy in the event of total or partial mobilization. Inactive Naval Reserve Personnel are functionally divided into two broad segments. The first segment consists of approximately 131,000 men and women who participate in monthly training at one of the 417 drill sites and participate in annual two-week Active Duty for Training (ACDUTRA). This pool of personnel is managed by the Commander, Naval Reserve Force. The second group, managed by Commander, Naval Reserve Personnel Center, is comprised of personnel who have completed all of their individual reserve commitments and do not participate as drill deck assets. Collectively, there are actually six categories of these personnel, and each is

briefly described below. Figure 1 shows the categories, management responsibilities and approximate numbers of members.

1. Ready Reserves

Ready Reserves, more commonly known as Selected Reserves (SELRES) or drilling Reserves. These Reservists normally drill one weekend per month and participate in Active Duty for Training (ACDUTRA) for two weeks each year. Their participation is recorded and accumulated in a point system on an annual year basis. These points are used to determine whether an individual SELRES has attained a satisfactory points total for a "good year" of Reserve participation. As with active duty, a Reservist must accrue 20 years of satisfactory service to be eligible for retirement.

2. Individual Ready Reserves

Individual Ready Reserves (IRR) may fill individual military manpower requirements due to their special training, skills or professional qualifications (e.g., surgeons). They may accrue credit for Reserve participation without actually attending drills. They receive pay for their service, and are eligible for, but not required to participate in ACDUTRA.

3. Standby Reserves

Standby Reserves are classified into two subgroups, the Active Standby Reserves (S1 status) and the Inactive Standby Reserves (S2 Status).

RESERVE PERSONNEL CATEGORIES

Category	Managed By	Number	Total
SELRES Ready Reserves	CNRF	131,000	
IRR Individual Ready Reserves			750,000
Standby Reserves S1 and S2	NRPC	619,000	
Fleet Reserves			
Retirees			
New Accessions			

Figure 1.   Reserve Personnel Categories

Active Standby Reserves (S1 status) are personnel who are eligible for promotion and may drill in a non-pay status. They may also complete Navy Training Courses for participation and retirement point credit. However, they are not eligible for ACDUTRA.

Inactive Standby Reserves (S2 status) are not eligible to participate in drills, are not eligible for promotion and may not accrue retirement point credit. They may, however move back to S1 Status by signing a Ready Reserve Service Agreement.

4. **Fleet Reserves**

Rather than being retired, enlisted members who have completed a minimum of 20 years service either on active duty or in the Reserves are transferred to the Fleet Reserves for a period of up to ten years or 30 years total service. They may voluntarily participate, but may not accrue additional retirement point credit. They are eligible for recall.

5. **Retirees**

Retirees, both USN and USNR are considered in an inactive status. They may voluntarily participate in a non-pay status, but cannot receive additional retirement point credit. They are eligible for recall during mobilization.

6. New Accessions

New accessions from Volunteer and Selective Service
Draft Categories may be pretrained or untrained assets
mobilized from the civilian sector.

In total, the Inactive Naval Reserve Component consists
of more than 750,000 personnel and their associated service
and medical records. Maintaining these records requires a
tremendous amount of data that must be updated and verified
to ensure that adequate personnel resources are ready to
support and defend the United States. In the event of
mobilization, Reserve assets will be matched against
predetermined mobilization billet requirements of active duty
commands. The billets and mobilization requirements
themselves are compiled by the Chief of Naval Operations
(OPNAV) using the classified Naval Manpower Data Accounting
System (NMDAS). Unclassified reserve billet information is
subsequently passed through the IMAPMIS system where reports
are produced for CNRF on the Reserve Unit Manpower
Authorization System (RUMAS). These reports are used for
manual structuring Reserve Units. Once structured, the data
is returned to NRPC for input into IMAPMIS.

This thesis, in examining the establishment of a separate
SELRES database, will concentrate on the portion of the NRPC
corporate database that directly concerns the Ready Reserve

(SELRES) that fall under the jurisdiction of the Commander, Naval Reserve Forces for training and mobilization.

B. HISTORY OF IMAPMIS

The master files for all Naval Reserve personnel, as previously stated, are maintained by the Commander, Naval Reserve Personnel Center in New Orleans, LA. However, until April 1989, the ADP management for these records, files and recently converted database was the responsibility of the Naval Military Personnel Command, NMPC-9, Director/Special Assistant for Naval Reserve Matters (with dual responsibility as OP-01R). This office, located in Washington, DC and physically separate from NRPC, is the command responsible for running the system.

IMAPMIS today is a conglomeration of smaller systems whose origins can be traced back to the Naval District organization. Its functionality has evolved minimally since its inception in the mid-1970s at the Naval Training Center in Bainbridge, MD. However, its efficiency has diminished significantly as the system has migrated through seven different hardware suites during its lifetime. Initially a batch-oriented sequential file, tape system fed by punched cards, IMAPMIS was designed to update Naval Reserve personnel data on a monthly basis and to report mobilization billet requirements on a quarterly basis. As recently as 1981, the data collected at

NRPC was sent to Washington, DC where it was processed on the OP-01 mainframe computer. Due to the massive volume of approximately 750,000 records, a typical monthly update run required a minimum of seven days to process. The quarterly mobilization requirement file updates from active duty inputs required an additional 25 hours of processing time (IMAPMIS SDP I,1983). Any errors identified during the monthly processing were returned to the local Naval Reserve Activity (NRA) for correction. The monthly processing schedule caused inordinate time delays in error detection and correction, and could prevent a SELRES from receiving drill pay for two to three months. Another significant problem involved accurate identification of current mobilization billets. SELRES Personnel Mobilization Teams (PMT), who are responsible for the initial mobilization of Naval Reserve IRR assets, found it impossible to accurately identify valid billets. At any given time, the mobilization billet listings available to the PERSMOB Teams could be three months old and created confusion resulting from inaccurate readiness information during recall and mobilization exercises.

In regard to the state of IMAPMIS in 1981 and its impact on the SELRES and NRPC:

> The Naval Reserve Personnel Center cannot properly perform its mission with regard to maintenance of current, accurate, timely personnel files, support for mobilization, or provision of scheduled and ad hoc reports to DOD and DON users. The monthly update cycle provides data which is in a range of 45 - 65 days old by the time

the information is available to users. In case of data exceptions a minimum of an additional 30 days must be added. As a result ... managers of Inactive Personnel will continue to make major management and policy decisions based on inaccurate, invalid and non-current information or no information at all. (IMAPMIS MENS,1981)

In October 1981, out of desperation, the Chairman of the National Naval Reserve Policy Board specifically addressed the shortfalls of IMAPMIS in a memorandum (NNRPCB Memo,October 1981) to the Chief of Naval Operations. He complained of the overall "inadequacy of computer support for Naval Reserve manpower and personnel administration." The memo requested corrective actions be undertaken immediately to alleviate the inability of the Naval Reserve to quickly restructure Selected Reserve Mobilization billets among Naval Reserve Activities to match changes implemented by active duty commands. This problem directly contributed to improper structuring of Reserve Units and often reflected a misrepresentation of the training levels of personnel assigned to these units.

A second immediate problem addressed in the memo concerned the inadequacy of IMAPMIS to maintain accurate personnel records and its inability to provide fast accurate drill reporting error feedback to NRAs. The memo proposed that if errors were detected early and information provided to the activities, corrections could be submitted prior to the actual data transfer to the Naval Finance Center, Cleveland, OH. This would significantly enhance the generation of accurate

and timely ACDUTRA and monthly drill pay. In the existing environment, errors in drill reporting were not detected until the data tapes were processed on hardware physically located in Bratenol, OH and resulted in inordinate delays in processing pay checks.

As a result of repeated complaints of this nature, it was decided that IMAPMIS should be redesigned and converted from the archaic batch, transaction-oriented system to a relational data base management system (DBMS). The Mission Element Needs Statement (MENS) for the conversion of IMAPMIS was submitted on 15 July 1981 by NMPC-92, and the first version of the new relational database was put on line in April 1989. The IMAPMIS redesign effort, starting with Milestone 0 approval in September 1981, was followed by Milestone I approval in January 1983, and Milestone II approval in January 1989. The "redesign" as it is commonly referred to, did not modify or enhance the operations, interfaces or functionality of IMAPMIS, but merely transposed the flat file batch records into a relational database. Meanwhile, over the 9 years of development and transition, requirements for IMAPMIS to provide more accurate and timely information, and needs for ad hoc management reports have grown exponentially. Future anticipated reporting requirements of IMAPMIS also indicate that the system, already taxed beyond its capabilities, will

soon be unable to provide even the most basic requirements of the Commander, Naval Reserve Force.

Over a span of the past twenty years, IMAPMIS has been shuffled from one computer hardware suite to another without any effort to redesign or develop new functionality capable of taking advantage of increasingly sophisticated hardware and software environments. Simultaneously, internal and external demands and requirements for timely, accurate, up-to-date information have increased significantly. Yet the "redesigned" IMAPMIS remains an archaic system that does not meet the current requirements of today's fast-paced world and need for ad hoc management reports. Problems abound with the accuracy of reserve unit structure, personnel records and the drill reporting system that authorizes SELRES pay. Inputs to IMAPMIS are still designed around a flat-file diary entry mentality and data tapes are bulk data transferred for relatively low priority bi-monthly, processing on the hardware at the Consolidated Data Center (CDC) in Bratenol, OH. Converting IMAPMIS to a relational database resulted in only limited improvements in processing times. However without functional enhancements to help managers keep pace with the most urgent requirements, IMAPMIS performance has degraded to a level considered totally unacceptable to the Commander, Naval Reserve Force. (CNRF letter,7 November 1989) (CNRF letter,10 November 1989)

IMAPMIS was then and is now an antiquated, inefficient system unresponsive to user requirements. The goal of this thesis is to examine the specific problems encountered by CNRF in using IMAPMIS as its corporate database, and then subsequently to explore the feasibility of creating a separate SELRES database controlled by CNRF for SELRES. It is proposed that this new database may help streamline the existent data flow architectures and eliminate unnecessary data passing and duplicate edit checks among systems. Finally, it will provide a comparison of the advantages and disadvantages of each system from the CNRF and SELRES perspective.

II. FUNCTIONAL AND OPERATIONAL DESCRIPTION OF IMAPMIS

As a system, IMAPMIS is a highly complex entity that is interdependent on other systems and inter-organizational by nature. It exchanges, passes and processes data that crosses both functional and organizational boundaries. IMAPMIS supports all six categories of Naval Reserve personnel discussed in chapter I. It involves the collection, processing, maintenance and dissemination of all data regarding Inactive Naval Reserve personnel. It is described as:

> ...the official source of all Inactive Reserve Personnel information and, as such, ...is central to all other Reserve Component application modules which either pass data to it or receive data from it, or both. Additionally, it is responsible for providing key personnel and drill attendance data to the Navy Finance Center, Cleveland for financial accounting purposes and a total monthly personnel extract to DOD. All official inactive personnel and drill transactions must flow into the IMAPMIS system and all scheduled or ad hoc reports or file extracts are generated from it. (IMAPMIS MENS,1981)

With such a large and varied population to support, the functional requirements of IMAPMIS are complex and differ greatly according to the personnel category being supported.

In this chapter, the functions of the IMAPMIS will be delineated and the individual command relationships and their respective responsibilities discussed. This will be followed by a synopsis of the many systems, subsystems and files belonging to IMAPMIS. Additionally, the major inputs, outputs

and overall system data flow architecture and IMAPMIS interfaces with other systems will be examined. The final section of the chapter will discuss some of the more significant shortfalls, and the impact that these problems impose on the SELRES community and CNRF will be discussed. The first aspect of IMAPMIS that will be addressed involves the system functionality.

A. IMAPMIS FUNCTIONALITY

IMAPMIS provides many functions for Inactive Naval Reserve Personnel, as well as for external commands such as the Director of Naval Reserve (OP-095), CNRF, OPNAV, NRPC. In many ways, it replicates or mirrors similar active duty systems, particularly in respect to personnel data collection, processing and information storage. However, IMAPMIS is tasked with many additional functions that, within the active duty environment are performed by separate commands with independent systems. The conglomeration of these disparate functions into a single monolithic system, have made IMAPMIS a highly complex entity where organization responsibilities are vague and difficult to trace. It is even more difficult to ascertain the exact origin of data elements or the source of data errors. The result is a system that essentially runs the users rather than allowing the users to run the system or a prime example of the tail wagging the dog.

From a general perspective, IMAPMIS is comprised of essentially four major functions. These may be further subdivided for better understanding, however they are primarily related to:

1. Mobilization Billet information, Reserve Unit Billet Structures, and SELRES assignments to billets
2. SELRES drill and ACDUTRA participation data capture and storage
3. Personnel records and data update, and
4. Transfer of personnel data between active and inactive personnel systems

The primary objective of IMAPMIS is to manage the Naval Reserve database. This database, the official source of all Naval Reserve personnel data is a major subcomponent of the NMPC Manpower, Personnel and Training Information System (MAPTIS) and contains critical data concerning both mobilization billets and the Inactive Naval Reserves who will fill them. Although it supports all categories of reserve personnel, this chapter will focus on functions that are specific to the SELRES community.

Interestingly, SELRES personnel comprise only about 18% of the total Inactive Reserve population, yet transactions supporting SELRES personnel account for an overwhelming majority of data inputs and updates at and through NRPC. A

check of NRPC manual transaction logs revealed that during the month of September 1989 approximately 60,000 transactions were hand-keyed updating IMAPMIS. Of these transactions, over 65% were estimated to pertain to SELRES.

1. Mobilization Billet Requirements

Perhaps the single most important function of IMAPMIS is to provide the Commander, Naval Reserve Force (CNRF) with current, frequent updates of reserve billet requirements. Once the billet requirements are generated on RUMAS and printouts are provided to CNRF, they are then used to structure these billets into Naval Reserve Units to which SELRES personnel will be assigned. Training requirements are established with the ultimate goal of being able to provide adequate numbers of pre-trained SELRES personnel to fill active duty billets in the event of mobilization. Current and accurate reporting of active duty requirements enhances the ability of CNRF to properly structure Reserve Units among its 417 training sites and its ability to provided for the most efficient use of both training and personnel resources. IMAPMIS, by functional description must be capable of allowing preassignment of over 200,000 SELRES within an environment where over half of these assignments normally change over a three-year period. In the event of mobilization, IMAPMIS should also support the assignment and activation of

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approximately 30,000 personnel in the course of any single week.

2. Individual Participation Credit

Another major function of IMAPMIS is to collect and maintain all Inactive Naval Reserve participation data. The total number of points that each individual officer earns and the reason they were awarded is collected and summarized on annual basis. (Enlisted data are still recorded manually and plans are to incorporate this function in phase two of the IMAPMIS redesign.) The reservist's anniversary date is used as the basis for this point capture. The summation of these points determines the members retirement eligibility. Points are earned for drill completions, Active Duty for Training (ACDUTRA) completion, credit for completion of training courses and credit for any pre-reserve or other extended periods of active duty. NRPC is responsible for accurate and timely update of individual SELRES participation and retirement points as well as maintaining current point captures for all Inactive Naval Reservists. These point totals and certification of retirement eligibility are passed to the Navy Pay and Personnel System (PAYPERS) and NFC for disbursement of retirement pay.

A function parallel to tracking the ACDUTRA and drill participation for SELRES provides accounting and financial data status to OP-095 for the purpose of managing the Reserve

Personnel Navy (RPN) appropriation. The annual RPN appropriation is the allowance of funds from which SELRES and active duty support personnel are paid. The total expenditures must be monitored closely by OP-095 to preclude exceeding congressionally mandated authorization levels.

3. **Personnel Records and Data Update**

IMAPMIS serves as the master repository of all Inactive Naval Reserve personnel data (service and medical records). In this capacity, NRPC is tasked with maintaining and updating this data as well as providing collected data to external systems in pre-programmed and limited ad hoc formats. Critical data items such as officer promotional status, individual drill status, paygrade/rank information and current address files are maintained. Other important elements such as names of beneficiaries, and next of kin are maintained. It is vital that members' personnel data are correct and updated in a timely manner. Errors can drastically affect reported strengths, training levels and SELRES pay.

4. **Data Transfer**

Finally, IMAPMIS allows for the transfer of personnel data to and from active duty systems. Through data updates from NMPC, IMAPMIS and NRPC receive records of individuals who are being released from active duty and transferred to the Inactive Naval Reserve. Conversely, IMAPMIS must also provide personnel records and data to active duty systems for

personnel who either terminate their reserve commitments and return to active duty or are recalled for extended periods of active duty. This particular functionality will become critical in the event of mobilization where massive numbers of personnel records must update active duty systems. Errors in data will adversely affect mobilization.

It is estimated that IMAPMIS generates approximately 433 cyclical reports and is relied upon as the sole source of support for over 500 non-standard, ad hoc management inquiries per year. The capability to expand IMAPMIS in order to satisfy ever-increasing demands in compliance with DOD and Congressional information demands is severely limited. Improvements to IMAPMIS anticipated in the follow-on stages of the redesign project include a review of all system outputs and output methods. All existing programs will be replaced by new applications and an enlisted automated participation point capture system will be developed. (IMAPMIS SDP III,1989)

However, the conversion project to date has exceeded cost projections by $1,589,761 and:

> When compared to the schedule provided...it is apparent that this project fell well behind projections. This reflects funding limitations, restrictions placed on the ADP project manager by unforseen and unforeseeable events, procurement delays, and, to some degree over-optimistic projections. (IMAPMIS SDP III,1989)

Additionally, SELRES constitute only 33% of the total record maintenance responsibility of IMAPMIS and error

corrections and updates account for over 17% of all data inputs to IMAPMIS. This reflects a tremendous manpower requirement for input of data. Development of new programs that will support interactive input update is only one of many high-priority enhancements required for future development. In the present environment of budget reductions and the intense congressional interest in large centralized Automatic Data Processing (ADP) and software development projects it is uncertain when or even if these enhancements will be approved and become operational.

B. COMMAND RELATIONSHIPS AND RESPONSIBILITIES

In addition to having a firm grasp of the overall functionality of IMAPMIS, one must also understand the interoperability and complex inter-command relationships and responsibilities associated with IMAPMIS. To actually support the previously discussed processes, IMAPMIS must provide operational interfaces, either direct or indirect, with internal and external systems. These interfaces create unique and often conflicting requirements within the system. It is almost impossible to ascertain the origin of a data element or produce an audit trail depicting the location and time of the most recent update. As can be imagined, "The problem of maintaining high quality records in an information system is magnified in an inter-organizational computer system."

(Laudon,January 1986). The same data may be used for several different purposes at differing management levels. The quality and timeliness of the data also differs among the users, making it virtually impossible to specifically define the requirements of the system. Many of the processes that generate information and reports use inputs that are outputs from other processes. Subsequently, errors in the original data items may be altered, modified and further corrupted.

The following sections list the major command relationships of IMAPMIS along with a very brief synopsis of the information/data required by each and at what level and manner the data is used. As can be seen, the levels of interaction and type of data provided among these systems varies dramatically. Figure 2 provides an overall view of the individual commands and organizations that depend on or utilize IMAPMIS data.

1. Chief of Naval Personnel (OP-01) - Washington, DC

The Deputy Chief of Naval Operations (Manpower, Personnel and Training) provides ADP hardware, software and facilities in Washington, DC in support for IMAPMIS. A subordinate code, OP-16 is also responsible for establishing and enforcing data element and Navy Live Cycle Management standards.

COMMAND HIERARCHY
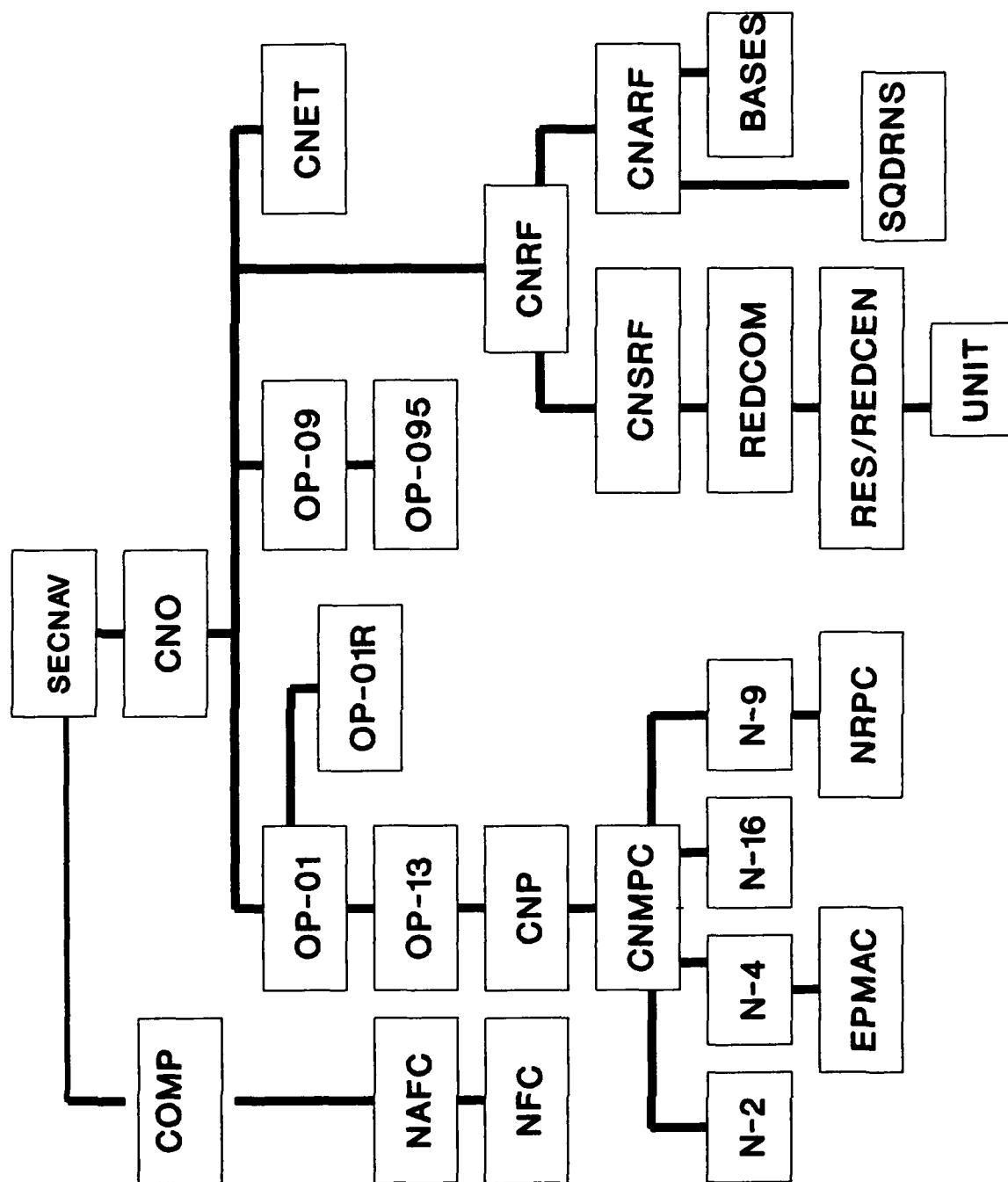
Figure 2.   Command Hierarchy

2. **Chief of Naval Operations (OP-095) - Washington, DC**

The Director of Naval Reserve, under the direction of the Chief of Naval Operations, provides periodic compilations of mobilization billet requirements to IMAPMIS. This billet data is passed to IMAPMIS from NMDAS at OPNAV. IMAPMIS would then generate hard copy reports that were delivered to the Commander, Naval Reserve Force headquarters for the purpose of determining the manpower structure of the reserve units. This relationship is expected to change in June of 1990 and the billet data will be provided directly from OPNAV's NMDAS system to CNRF's new Reserve Training Support System (RTSS) through direct interface.

3. **Naval Military Personnel Command - Washington, DC**

Naval Military Personnel Command (NMPC) establishes, implements and administers policies for assignment, retention, separation and discharge of inactive Naval Reservists. These functions are accomplished through direct liaison with its subordinate command, NRPC and indirectly with OP-095 and CNRF. NMPC provides personnel data to IMAPMIS through the Officer Personnel Information System (OPINS) and the Naval Enlisted System (NES) and the Source Data System (SDS). Additionally, NMPC-9/OP-01R requires access to IMAPMIS to determine officer promotion history and eligibility using the Inactive Officer Promotion Administrative System (IOPAS). In this relationship, NMPC-9, the inactive reserve counterpart to

NMPC-2 for active duty personnel, convenes all reserve officer promotion boards and updates officer promotional status at the conclusion of each board using the Inactive Officer Administrative Promotion System (IOPAS). It is imperative that IMAPMIS reflect accurate data such as date of rank and proper designator. Incorrect information may inadvertently preclude an otherwise eligible officer from promotion. It is equally important that promotion updates entered by NMPC into IOPAS properly update the promotional history file.

4. **Naval Reserve Force - New Orleans, LA**

Commander, Naval Reserve Force (CNRF) is responsible for structuring Reserve Units from mobilization billet requirements provided from NMDAS at OPNAV. Structuring billets into units involves accessing total billet requirements and matching needs against available SELRES assets. By optimizing matches between SELRES assets and billet requirements, CNRF can maximize unit manning, enhance training levels and improve unit cohesiveness. The goal is to assign as many SELRES to local units as possible and to eliminate the need to assign an individual to a unit in a geographical area different than his/her home. Once the units are structured, training requirements are established after the billets are fed back into IMAPMIS during the next processing update. Only after all these steps are completed, and after the new unit/structure is reflected on the hardcopy

reports from IMAPMIS, can CNRF and local Naval Reserve Activities (NRAs) assign SELRES to these billets. Presently,the structuring process is completed manually at CNRF from billet listings produced by RUMAS. Unit structuring is a difficult, time consuming process. Without the aid of automatic processing support it is difficult to assess the decisions determining unit size, placement and composition. The direct data exchange from NMDAS to RTSS anticipated in June 1990 is now in a testing phase. However, it is expected that this new interface will significantly expedite Reserve Unit billet structuring process. Additionally, a new decision support system is being developed for RTSS system that will significantly enhance the structuring process. As a result, CNRF should be able to make far better decisions regarding unit placement and manpower composition than can be accomplished with the manual procedures necessary with IMAPMIS.

An equally important responsibility of CNRF is to effectively train and administer the SELRES community in preparation for mobilization. Once the reserve units are structured and manned, it is necessary to monitor the level of manning and quality of training completed within those units. Units are assigned training and readiness status based on these training achievements and individual unit manning levels. This data is used both internally for planning and

evaluation purposes as well as externally for overall force status reports. The accuracy of this data is vital to an accurate representation of the welfare of the Naval Reserve.

5. **Navy Finance Center - Cleveland, OH**

The focal point for active duty navy personnel financial processing, the Navy Finance Center (NFC) also accounts for all drill, ACDUTRA and retirement pay, based on drill and personnel data passed from IMAPMIS. Concurrent with the decision to redesign IMAPMIS in 1982, it was determined that the main IMAPMIS processes would be run on the CDC system that supports NFC, thus allowing the consolidation of all pay processing for both active duty and reserves on a single system. Necessarily, this command relationship is critical for SELRES and retired reserves. Although few data changes may disrupt retired pay, any number of invalid or incorrect personnel data elements affect the timely, accurate drill pay of SELRES personnel.

6. **Naval Education and Training Center - Pensacola, FL**

The Chief of Naval Education and Training Center (CNET) provides results of correspondence course completions to IMAPMIS. Completion of these courses by Naval Reservists adds to individual accumulations of Reserve Retirement Participation Points. Presently, the course completion documents are mailed to NRPC where they are hand-keyed into IMAPMIS. There is no method to track or validate inputs and

it becomes, by default, the individual's responsibility to ensure that these points are actually awarded.

7. **Naval Reserve Personnel Center - New Orleans, LA**

Naval Reserve Personnel Center (NRPC), a field command of NMPC, is responsible for maintaining the corporate personnel data base of Inactive Naval Reserve Personnel for NMPC. This includes total management and assignment responsibility for all Pre-trained Individual Mobilization (PIM) assets (IRR personnel, standby reserves, fleet reserves, and retirees). These personnel assets are totally independent of CNRF and do not actively participate in monthly training drills. NRPC is solely responsible to NMPC for maintenance of service records and personnel data.

In addition to PIM administration, NRPC is also tasked with the production and distribution of reserve billet requirement, manpower and personnel reports. To support these reporting requirements, NRPC updates personnel data from and for both PIM assets and SELRES.

C. IMAPMIS SYSTEMS, SUBSYSTEMS AND FILES

Within IMAPMIS are several major subsystems and file applications that support the functionality and command relationships described above. A brief description of these subsystems, shown in Figure 3, is provided in the following sections.

IMAPMIS INFORMATION CHART

- RESFIRST — FIELD INPUTS
- RTSS — CNRF TAPE INPUT
- RSTARS — FIELD INPUTS
- NEOPS — PARTICIPATION FOR RETIREMENT
- IOPAS — OFFICER PROMOTION UPDATES
- IEMF — ENLISTED PERSONNEL DATA
- MAPTIS
- IMAPMIS
- IFILMAN PROCESS
- IOMF — OFFICER PERSONNEL DATA
- IRIS
- PIMMS — PIM MEMBER DATA
- NMDAS — MOB BILLET REQUIREMENTS
- RUMAS — MOB BILLET UNIT STRUCTURE
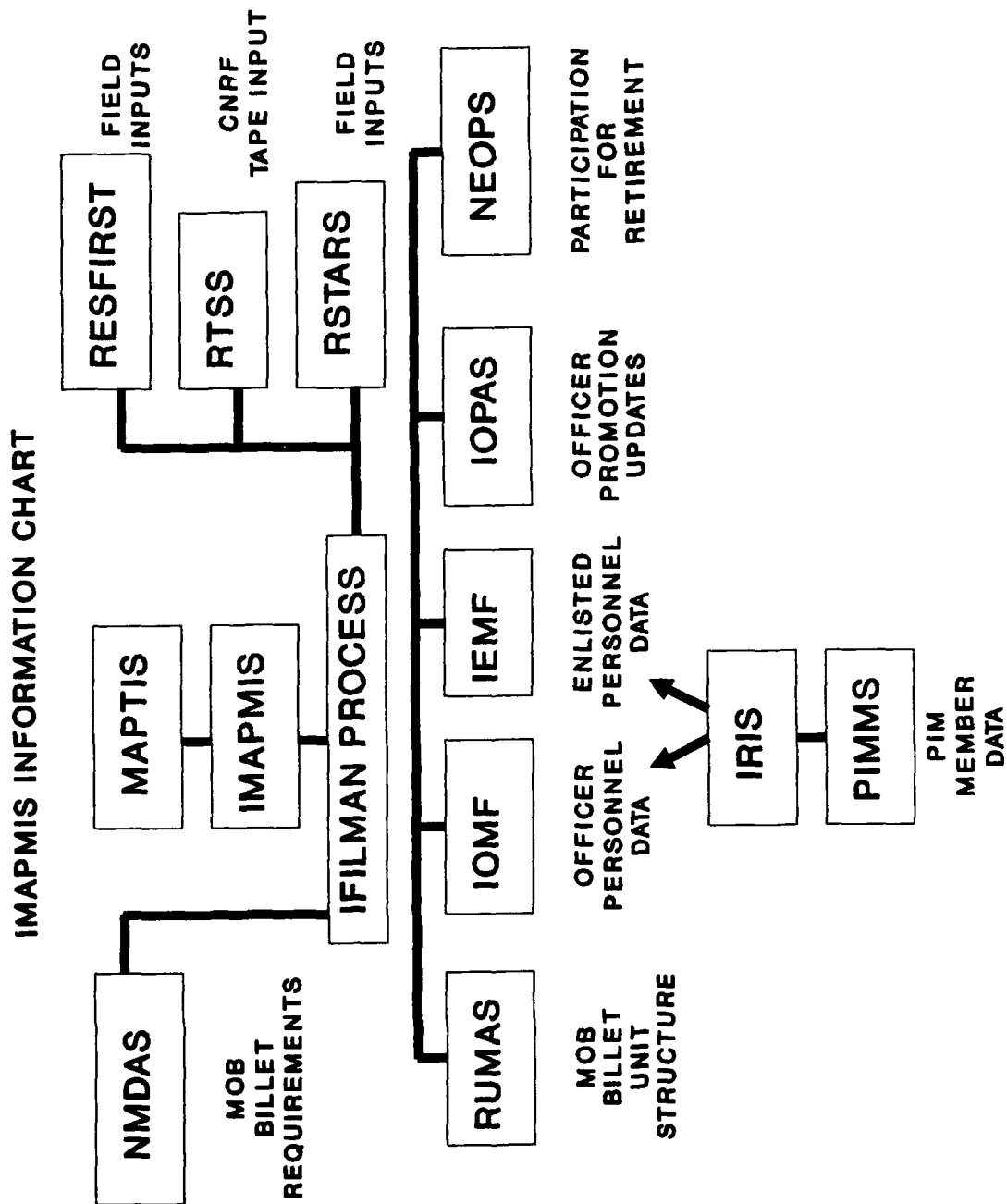
Figure 3.   IMAPMIS Information Chart

30

1. **Inactive File Maintenance System (IFILMAN)**

IFILMAN is the central processing system in IMAPMIS and actually produces the updated files and reports. It accepts data generated by NMPC, OPNAV, NRPC, CNRF and reserve field units. When processing runs are made, all input data is pre-edited. These edits checks are predominantly for valid change codes, postal addresses and zipcodes and designators. One estimate reflected a monthly average of 200,000 data element updates to personnel records and for approximately 300,000 drills (IMAPMIS SDP I,1983). Additionally, IFILMAN processes and matches this data against mobilization billet files. Rejected transactions are returned to NRPC while valid transactions update the IMAPMIS master files.

2. **Reserve Unit Manpower Assignment System (RUMAS)**

CNRF and NRAs use RUMAS outputs to manage the proper mobilization billet assignments of SELRES. After units are authorized and established by OP-095, the units are structured by CNRF and the billets are filled by SELRES. The mobilization files include billet requirement data such as: the rank or rate, rating and applicable NOBC or NEC of personnel that can be assigned to each individual billet, the actual structure of each reserve unit and which individuals are actually assigned to those units/billets. Billets that are designated to be manned from 30 to 90 days after initial recall (M+1 to M+3 designated billets) are filled by IRR,

standby reserves, fleet reserves and retirees. These assignments are managed by NRPC. Immediate mobilization billets are managed by CNRF and manned by predominantly SELRES assets. RUMAS accepts billet input from NMDAS, and in addition to producing unit reports, compared actual assignments against valid billets. The principle outputs of RUMAS assist OP-095, NMPC, CNRF and NRPC in effective management of reserve personnel to effectively support active duty mobilization requirements.

3. **Inactive Remote Inquiry System (IRIS)**

IRIS is a pseudo real-time update capability that provides data from the Inactive Officer and Inactive Enlisted Master files. It allows limited update capabilities for specific data elements. Most updates apply to Pretrained Individual Mobilization Manpower assets (PIMMs), the NRPC managed personnel pool. The system is processed on EPMAC hardware in New Orleans, LA and accepts hand-keyed transaction entered through NRPC, NFC and NMPC terminals. Data tapes are generated from the updates and are used during the next periodic IMAPMIS process to update master files.

4. **Navy Enlisted and Officer Retirement Point Recording System (NEOPS)**

The system that captures and accumulates Naval Reservist credit accrued for completion of drills, ACDUTRA, active duty and completion of Correspondence Courses is called

NEOPS. The recording and update of these points are essential to reservists. Members of the Inactive Naval Reserve must accrue adequate points for each anniversary year they participate in the reserves in order to obtain credit for a "good year". In order to satisfy the requirements for a Certification of Eligibility for retirement and authorization for retirement pay, a reservist must have completed 20 years of satisfactory service. The points are accrued from active duty participation, drill participation, fulfillment of annual ACDUTRA requirements, and completion of navy training courses.

5. **Inactive Officer Promotion Administrative System (IOPAS)**

IOPAS is operated and updated by NMPC-93C, Reserve Officer Promotions, and provides up-to-date promotional history of officers in the Naval Reserve. IOPAS provides the capability to update officer status, such as changes from active to inactive service and maintains the inactive officer precedence order. In addition, it provides lists used to determine eligibility zones for promotion boards and is used to generate ALNAV messages indicating promotion selections. The IOPAS subsystem also has on-line terminals from which the transaction updates produce another data tape.

6. Pretrained Individual Manpower Management System (PIMMS)

Updates pertaining to Inactive Naval Reservists managed by NRPC use the PIMMS subsystem. PIMMS is essentially independent of IMAPMIS even though the inputs are keyed by NRPC personnel and the transaction data tapes are merged into IMAPMIS master files during processing. It is primarily used for career counseling and individual support of NRPC personnel assets and pertains mostly to non-SELRES applications. The on-line data is provided from extracts of the IRIS subsystem.

7. Inactive Officer Master File (IOMF)

The IOMF mirrors the active duty Officer Master File. It acts as the central repository of all Inactive Naval Reserve officer personnel data. Data may be entered into the IOMF from keyed input at NRPC or from many data exchange tapes processed in bi-monthly runs.

8. Inactive Enlisted Master File (IEMF)

A complement of the active duty Navy Enlisted System (NES), the IEMF stores all data pertaining to Inactive Naval Reserve enlisted members. It is similar to the IOMF.

D. IMAPMIS INPUTS, OUTPUTS AND INTERFACES

1. Inputs

Data is input into IMAPMIS at many different sources in many different ways. Some of these sources have on-line,

real-time update capability while others are recorded on tape for future update processing. Among the major sources of data input are the Reserve Field Reporting System (RESFIRST), the Reserve Training Support System (RTSS), and several active duty automated information systems including the OMF, NES and SDS.

The data collected from the individual NRAs was, until mid-1989 submitted entirely through the RESFIRST system. All personnel data involving reserve members was typed on OCR scannable forms and submitted by mail to NRPC. Even the drill chits that indicated participation in monthly training were processed on special forms that were mailed directly to NRPC where they were scanned. Data tapes were generated with this drill information and updates including unit assignments, advancements and status changes. If the document could not be scanned due to errors, it was returned to the NRA for correction. If the document was scannable, but the entries were not correct, the errors were not detectable until the next scheduled processing run. This enormous paper system, designed around the old diary entry process was time consuming and often documents were lost or damaged. Additionally, many errors were not discovered for weeks. Once the system was updated some errors were detected and filtered through the system, eventually reaching the NRA for correction. However, the most frequent means by which NRAs were apprised of errors

resulted when the reserve member received a check for an incorrect amount of pay, or did not receive a check at all.

As recently as April 1989, CNRF has brought the Reserve Standard Training, Administrative and Readiness Support System (RSTARS) on line. This system which feeds data to RTSS has decentralized data processing and centralized control. It is designed for modular applications development uses the microcomputers at the individual NRAs for the input of reserve data. The data structures, definitions and interfaces and edit checks to conform to interface agreements formulated with IMAPMIS program managers. RSTARS allows for localized data inputs rather than requiring submission of OCR paper documents for future scanning. The personnelmen at the drill/training sites can now physically key in the data updates. Those who use and understand the data now have the capability to enter the data. Daily data updates are then transferred electronically via modem to the CNRF mainframe on a nightly basis. In addition to the built-in standard data entry edits, the CNRF processing also validated codes and data elements. Transaction errors were captured and a complete update of rejections was transmitted to the originating NRA during the next nightly communication. From the data updates, CNRF's RTSS system produces bi-monthly tapes that are to submitted to NRPC for IMAPMIS update processing. The data is bulk data transferred to the PAYPERS system for processing

with IMAPMIS. This new automated system improved the timeliness of data and reduced the delays inherent to the RESFIRST mail-in system. It is anticipated that by the end of 1990 all RESFIRST entries to IMAPMIS will be input through RSTARS and RTSS.

This source of data generates a high volume of transactions, anywhere between 35,000 to over 300,000 transactions per month. RESFIRST was originally scheduled for replacement by a Reserve module of Source Data System (SDS) that would eliminate the need for OCR diary submissions. However, within the last two years, the development of Reserve SDS was cancelled. To compensate for this setback, RESFIRST is instead being replaced by a CNRF developed RSTARS, which was designed around pre-negotiated SDS interfaces and data definitions.

2. Outputs

System output reports is the largest single product of IMAPMIS. Currently, data from IMAPMIS is output in an almost countless number of periodic reports that are submitted to OPNAV, NMPC, NRPC, Director of Naval Reserve, CNRF and the NRA. The major areas of reporting are personnel support, participation support, unit structuring support, administrative support and mobilization support. IMAPMIS creates approximately 350 tapes per month to support the report function and the redesign effort did not include a

requirement to replace these processes. Since these reports are very structured and many are obsolete, one of the major requirements of the current phase of the IMAPMIS redesign is to totally review and update all outputs.

The validity of many of these reports in their present form is understandably being questioned. Some reports and outputs have been determined as useless and are no longer being produced. Reserve Unit Assigned Documents (RUADs), produced on a monthly basis, should reflect accurate timely unit structure data. Many now reflect totally erroneous data. In one instance where multiple units and their related billets were examined, only one single billet reflected the correct rank and rates. (CNRF letter,7 November 1989) The significance of the data outputs is that IMAPMIS is the corporate source, under the auspices of NMPC and NRPC for all data relating to the Inactive Naval Reserve. The data collected and output by IMAPMIS is a direct reflection on the training, manning and readiness levels of the naval reserve. If the data is not credible, then the reports are also invalid. Managing a system as large as IMAPMIS is difficult at best. However, the quality of the naval reserve database is severely inadequate and reflects poorly on the dedicated individuals who participate.

3. Interfaces

As can be deduced from the previous pages, IMAPMIS is linked in one form or another to numerous internal and external systems. To be able to accurately transfer data among these various systems requires adequate interfaces that edit and validate incoming data, without tightly restricting data passage. This is a difficult division to make. Historically IMAPMIS has required inordinately tight edits on data for reasons that were applicable when the system was initially designed. However, many of these edits are no longer valid in today's environment (CDR R. Rautenberg, October 1989). Since the conversion of IMAPMIS to a database did not attempt to redesign the processes or requirements, many of these old requirements are still in place and functioning and have disruptive effects on all concerned. Currently all data is still comprehensively edited whether it is received from another automated system or input through CRT's. The data is checked for completeness, proper coding and data relationships. Other data is validated using reference tables, logic examinations and comparison to personal data already existing in the system. These edits were designed for the RESFIRST system rather than new relational database. The problem lies herein. If the data already contained in the IMAPMIS database is incorrect, then the edit checks will not allow the update of some data

elements. The problems that these interface constraints create is enormous. As previously mentioned, many data tape updates are not processed into master file updates on a real time basis. For the internal subsystems of IMAPMIS, a data element may have been corrected and a transaction generated on the data update tape only to find that weeks later when the tape is processed, the transaction may be rejected by an interface edit. An example of the complex sample data flows from the NRA to the generation of a SELRES paycheck is shown in Figure 4.

Another of the major external systems with which IMAPMIS must interface is the Reserve Component Common Personnel Data System (RCCPDS), managed by the Defense Manpower Data Center (DMDC) in Monterey, CA. RCCPDS, a DOD system that collects Reserve personnel data from all DOD systems.

Through the use of IMAPMIS, the Naval Reserve Personnel Center (NRPC) is tasked with maintaining current files on all 750,000 Inactive Naval Reserve personnel. To accomplish this task, IMAPMIS must interface with many external systems. These systems, belonging to other commands may simply accept data from IMAPMIS, pass data to IMAPMIS, or process available data. Systems that process data may or may not return updated data to IMAPMIS. Among the systems with which IMAPMIS must maintain workable interfaces are the Navy Manpower Data
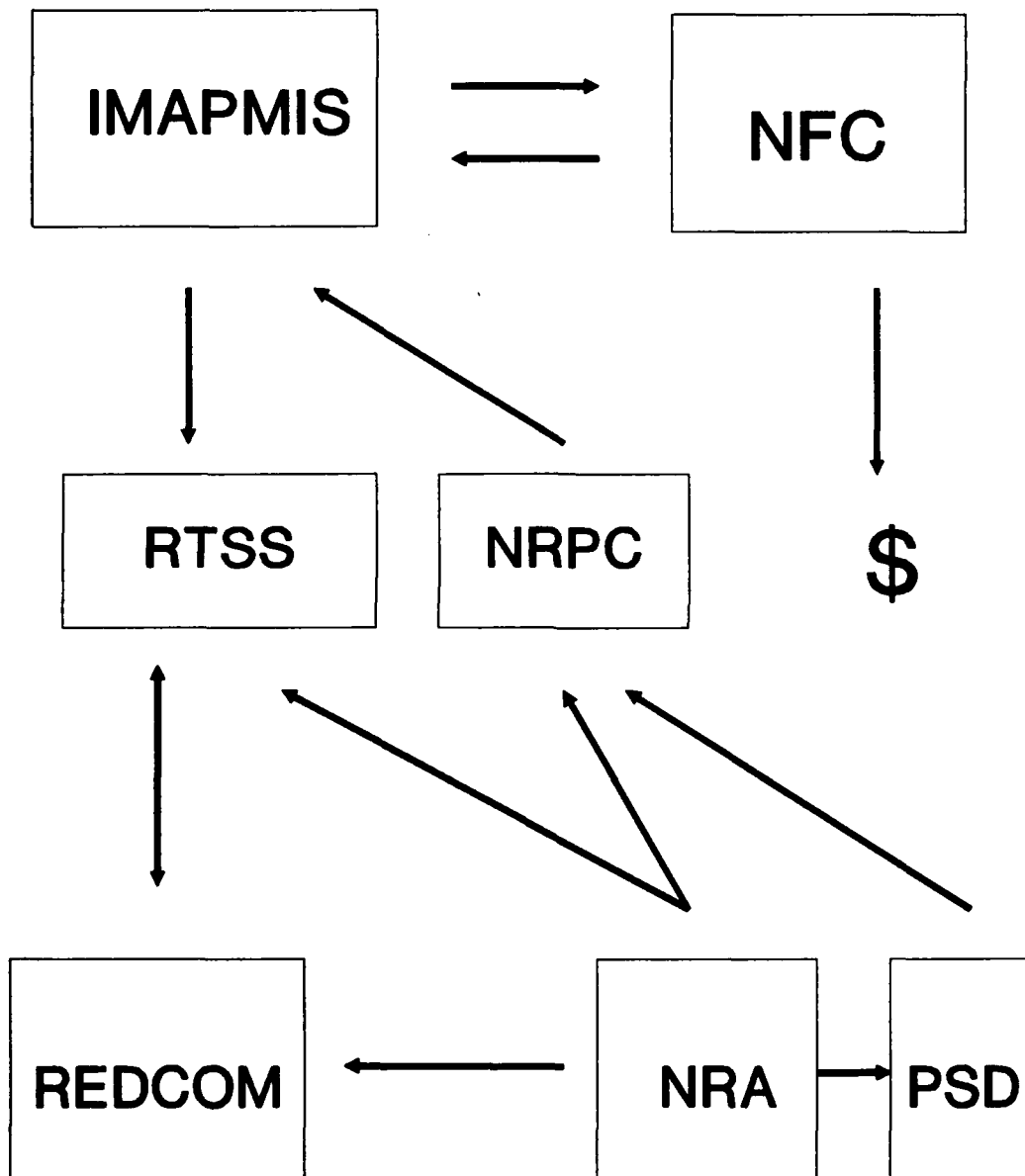
SELRES PAY DATA FLOWS

Figure 4. SELRES Pay Data Flows

Accounting System (NMDAS) to access mobilization billet requirements; all active duty personnel systems such as the Officer Master File (OMF) and the Enlisted Master File (EMF); the Navy Pay Personnel System (PAYPERS) hardware and software for processing drill and ACDUTRA pay; and DOD Reserve Component Common Personnel Data System (RCCPDS) to provide periodic and ad hoc reports. The quality of each of these interfaces is critical in their own way. CNRF and OP-095, responsible for training and readiness of SELRES require valid, accurate, up-to-date data on the status of the reserve community. The SELRES, who depend on accurate personnel data to ensure proper remuneration for reserve participation deserve the same accurate, timely transfer and update of data. NRPC, tasked with what seems an unmanageable responsibility must coordinate and administer a system that reports, accepts and processes data from many internal and external sources.

E. SHORTFALLS AND INADEQUACIES OF IMAPMIS

The Deficiency Statement contained in the initial System Decision Paper initiating the redesign of IMAPMIS stated:

> Valid, accurate and current information as well as financial data is not being provided to Selected Reserve Headquarters and field commands, or to many echelons of DON and DOD managers. We are not using an effective or efficient methods of transferring data between Active and Inactive files; mobilization pre-assignments as well as assignments at Mob-Day must be made manually and therefore cannot meet mobilization requirements; the NMDAS/RUMAS interfaces are totally inadequate and present numerous problems to OP-09R [now OP-095], CNAVRES and Reserve Field Commands with regard to incorrect manpower authorization

documents; and IMAPMIS data elements often do not match nor can be directly translated to those required by DOD and other users. Therefore, the Naval Reserve Personnel Center is not adequately performing its mission of providing personnel information support to its many users. Because of the age and migration history of the source code of IMAPMIS and the lack of documentation thereof, minor design changes to the system are attempted only in rare and emergency situations. (IMAPMIS SDP I,1983)

For the redesign of IMAPMIS, four alternatives were considered. The first was to continue with the status quo and not change IMAPMIS. The second alternative proposed a single interactive project to incorporate all required improvements to IMAPMIS. The third alternative, similar to the second, used a two-phase approach to improve IMAPMIS. The first phase would concentrate on redesigning the IOMF and IEMF and the operation to maintain them. The second phase would then build on the first phase and eventually improve the entire system. The final alternative was a three-phased proposal to first update the IOMF and IEMF, then modify output and report generations and add an ad hoc query capability and finally, the last phase would improve the interfaces between IMAPMIS and other external systems. The ultimate decision was to select the fourth alternative. During the initial planning phase, it was decided to concentrate on converting the existing flat file, sequential batch system into a relational database. The conversion which began in 1981 did not include any significant functional enhancements, allow development of the proposed ad hoc query capability, improve any of the

output/reporting formats, or improve any of the external and internal interfaces of IMAPMIS. With the new database being placed on-line and functioning in April 1989, the system is somewhat faster than the old version and some basic inquiries are more efficient. However, the inadequacies of the interfaces and the inability of IMAPMIS to provide OP-095 and CNRF with up-to-date, accurate information regarding Selected Reserves still exist. The first of the three phases took two years longer than the originally projected life cycle. Although new enhancements to IMAPMIS are being considered under phase two to improve these functions, other factors are draining resources. In an environment where data access, processing and utilization is paramount, government officials demand up to date information when making crucial decisions involving the Armed Forces. As the repository for all Naval Reserve personnel information, being able to provide accurate and timely data is rapidly becoming a major concern and priority for IMAPMIS managers and system planners.

Although improvements are essential, NRPC is responsible for providing information on all Naval Reserves. Selected Reservists comprise approximately 131,000 of the 750,000 records maintained by NRPC. However, this relatively small percentage of records generates a large percentage of NRPC workload.

It is important to recall the importance of the SELRES who comprise the backbone of the Naval Reserve. They represent the best trained, immediately mobilizable assets available to the Navy. Taking into account the multitude of conflicting priorities and pressures on NRPC, it is still necessary to remember that SELRES are vital resources and their needs must be addressed. Nothing more seriously affects SELRES retention, training levels and morale than the continued loss of or incorrect pay.

1. Mobilization Billet Structuring Problems

As discussed earlier in the chapter, updated mobilization billet requirements, reported through NMDAS, are essential to CNRF. Responsible for effective training of SELRES, CNRF's function is to structure these billets into individual reserve units at NRAs throughout the United States. The billets were passed through IMAPMIS to CNRF where they were manually manipulated into units. Without any computer aided support, it was a slow difficult process that usually did not yield the optimum unit structures. However, the CNRF computer department concurrently designed a limited decision support system (DSS) for helping the structuring process and is in the process of developing this application. After many years of discussion CNRF was finally authorized a direct interface with NMDAS to obtain the billet data through RTSS rather than passing data through IMAPMIS and waiting on

scheduled processing. This improvement, which is approved for June 1990 implementation will significantly improve the timeliness of data received by CNRF and with the DSS should prove to enhance overall unit structuring efforts. However, problems still exist in IMAPMIS where units that have been dissolved are still carried in the database. This happens because IMAPMIS defaults will not allow deletion of a unit until all assigned personnel are transferred out of the unit. If the individual transfer transaction is not accepted by IMAPMIS, the member will remain assigned to the unit and the unit will continue to be reflected long after being disestablished.

2. Interface Problems

The IMAPMIS interfaces as they exist today are totally inadequate to support the day to day data requirements of NRPC. A good illustration of interface problems involves an active duty member being released and transferred to the Naval Reserve. Although NES and SDS are updated to reflect the loss of the member and release orders are generated, IMAPMIS and NRPC are completely unaware of the pending gain to the Naval Reserve until the point in time that the individual's service record physically arrives in the NRPC mail room. Since IMAPMIS theoretically interfaces with NES and SDS, this data and the individual's service record information should be automatically transferred and a flag should be generated for

NRPC to expect the service record. In actuality, when the record is received at NRPC, it is screened manually for pertinent data items including a Reserve contract commitment and the member's current address. Exacerbating the frustration, the data, up to 19 fields, is hand-scribed onto a data input form that is later given to an operator who physically hand-keys the data into IMAPMIS. This initial input actually establishes the individual as a member of the Naval Reserve community. Without this data entry, the individual will not be reflected in the main IMAPMIS database regardless of his status in NES and SDS, and he/she cannot affiliate with a Reserve unit, participate in any reserve functions or receive any pay. The problem is further compounded when an individual is released from active duty and subsequently reports to the closest reserve activity to affiliate with a unit. The proper diary entries are made and submitted, but will be automatically rejected several weeks later when the system is updated since there is no record of the individual in the database. Interestingly enough, the active duty Officer Master File (OMF) and Enlisted Master File (EMF) were designed and completed by different contractors. Subsequently, the interfaces between these two systems and IMAPMIS are totally different. For officers, as an example, IMAPMIS does receive indications of losses from active duty and pending gains. However, similar types of data must be

hand-keyed into IMAPMIS after a physical screen of the officer's record. During a recent visit to NRPC, it was noted that operators were using Officer Data Cards (ODCs) generated by NMPC to input officer Naval Occupational Billet Codes (NOBCs) and Additional Qualification Designators (AQDs).

In addition to RESFIRST diary entry inputs, IMAPMIS now allows a bi-monthly update from CNRF RTSS system. The RTSS system is updated daily from a majority of the NRAs, thus maintaining a reasonably current, accurate database. Limited edit checks are built into the initial data capture at the activities, however, extensive edits are performed on uploaded data to ensure validity. When these checks reject data or inputs, the submitting reserve activity is aware of the problem the following working day. (Schwartz,October 1989,p.49) However, problems have surfaced with the interface with IMAPMIS. The RTSS database, a valid, accurate database is uploaded daily. Conversely, IMAPMIS is updated during bi-monthly processing runs and lags significantly behind RTSS. Within IMAPMIS there are numerous duplications of edit checks already performed in RTSS and additional edit checks that have little relevance on the data input. These edits routinely reject and override otherwise valid transactions obtained directly from the SELRES and input at the NRAs. These interface problems were specifically addressed by CNRF in correspondence to NRPC explicitly stating their frustrations

in attempting to analyze rejected transactions created in the interface of IMAPMIS and RTSS. The letter indicated that NRPC was not providing satisfactory support in attempting to identifying why transactions were being rejected from IMAPMIS. The CNRF perspective focused on the fact that there seemed "to be no effort to analyze refections to ensure they should in fact, be rejected." (CNRF letter, November 1989). In addition to data quality and SELRES pay problems, this perceived lack of responsiveness on the part of NRPC further strained the relationship between CNRF and NRPC. However, with the enormous workload at NRPC, the response is more likely attributable to trying to support too many priorities with sadly inadequate resources.

3. Design Problems

Still another problem within IMAPMIS involves the flat file mentality of the RESFIRST diary entry system. The diary entry was developed to provide numerous pieces of data collectively in a prescribed order and format for efficient update. Since the system was designed for batch, sequential processing, all data items had to be updated on a single pass, thus requiring that multiple data entries, in predefined formats. The entry was submitted on special forms typed in OCR fonts, and mailed in special envelopes to NRPC. There, the forms were hand-fed into optical scanners and data tapes were produced for later merging with the IMAPMIS database.

Few errors were detected upon scanning and most remained on the tape unidentified until processing, weeks later.

Within the RESFIRST diary input system, there were many transactions that were a series of entries "bundled" together. Multiple entries were required for a single personnel status change. A good example is a simple advancement. The change in status required two separate diary entries: the first for discharge of the member and is followed by an advancement entry. If these entries are in the wrong sequence or the discharge entry is omitted or erroneous, the advancement will not be recorded and the member will only be paid at the previous rate. Similarly, if an individual is transferred from one unit to another, an entry must first appear to show the individual as a loss to the original unit. This must then be followed by an entry for a personnel gain to the ultimate unit. Again, before the member can be properly assigned to the new unit, both of these entries must be made in the proper order. The normal sequence of events is such that the individual reports to the new unit the following drill period and a drill chit is processed and submitted. However, IMAPMIS still holds the member in the old unit. Not only is the drill chit rejected, disallowing the member's pay and participation credit, it also reflects that the member has missed a drill period at his authorized unit. Numerous other examples exist of these "bundled" transactions.

They all create major problems for the SELRES members and the NRA staffs that support them. Such problems as these tend to generate even more problems and inaccurate data throughout IMAPMIS. For example, a billet at the new unit is still unfilled according to IMAPMIS and it is possible that another member may be assigned. Conversely filled, the billet is shown as being vacant and detracts from the manning, readiness and training status of the unit. The individual is not receiving credit or pay for participation. Such problems may take anywhere from 45 to 90 days to correct. It is obvious that problems of this kind have a major waterfall effect and result in incorrect information concerning manning and training levels of SELRES.

4. Parallel Processing Problems

Expanding on the frustrations encountered with problems of "bundled" transactions, another significant processing problem was discovered after the database conversion was completed. It was noted that many of these "bundled" transactions w e being totally rejected from IMAPMIS processing runs. Only after months of research was it discovered that, by implementing a parallel processing capability to run IMAPMIS, the second or new data entry was often processed before the initial entry. Therefore, the system attempted to process the second entry before the first. This resulted in this specific transaction being rejected.

Subsequently, when the first transaction was processed, there was no second transaction to update the first. As can be imagined, the results were disastrous. Examples included advancement transactions where the individual advancement was processed before the discharge transaction. These transactions were immediately rejected due to the lack of a discharge entry. Next, when the discharge transaction ran, the individual was automatically discharged. Since the advancement transaction had already been rejected, the individual was then reflected in IMAPMIS as being discharged. Here again, the individual could not receive pay for drill or participation credit until the master database was updated. Support staff at the NRAs continued submitting the same entries, but were unable to correct the member's status. The resolution of this single problem took in excess of three months to identify and many instances still remain unresolved. Meanwhile unit strength codes were incorrect and members were not being properly paid.

5. Strength Code Problems

Within RESFIRST, SELRES are assigned strength codes to indicate the location of their service record and drill site. Since SELRES move frequently without transfer orders like active duty personnel, a system of tracking the member and his/her respective service record was essential. To do this, strength codes were devised. If the member and service record

were held by the same NRA, the strength code was valid and allows processing of personnel status updates. If the record and individual were not held by the same NRA, the strength code prevented many personnel data updates. If for some reason, a SELRES is not properly assigned to a unit, it affects an assigned strength code. If this strength code is not the proper value, the individual is not allowed, according to RESFIRST Manual, to be transferred, be promoted, discharged or physically die.

6. Audit Trail Problems

Actually affecting all of the previously discussed problems, another significant shortcoming of IMAPMIS is the lack of any audit trail for transactions. In the previous cases cited, there was no way to quickly identify problem trends. Once the transaction was rejected, it was gone. This lack of functionality makes it exceptionally difficult to troubleshoot or review for problem trends. A proposed solution would be to accept a single entry that would then generate the required data for both the first and second entries. Audit routines should be embedded into IMAPMIS. Most system users are aware that:

> The edit-validation-update-reject-correction-reentry process is considered critical...because it determines, to a great extent, the reliability of a systems's output. Unless handled properly, rejected transaction may be lost entirely or never corrected. (Benoit,May 1979,p.26)

Within IMAPMIS there is no provision for suspense files, automated error files or even minimal error messages. Since this single problem contributes heavily to others documented above, it should be a high level priority for future enhancements to IMAPMIS.

F. IMPACT OF IMAPMIS SYSTEM SHORTFALLS

As is illustrated in these few examples, IMAPMIS is a large, unwieldy system, designed around old hardware technology and concepts such as diary entries. IMAPMIS is inflexible, slow and unresponsive to the needs of today's SELRES. The problems enumerated above are primarily related to SELRES and represent only a few of an overwhelming number of enhancements that are required in IMAPMIS. System interfaces affect every reserve category and have serious effects on the quality of data reported to external systems such as RCCPDS. These erroneous reports generated from poor quality data do not accurately reflect manning levels, training and readiness status and overall condition of the Naval Reserve Force. The problems associated with "bundled" transactions must be evaluated and realistic database management solutions applied. The entire design of IMAPMIS should be evaluated to more clearly identify individual command responsibilities and data ownership. Similarly, the possibility of segmenting IMAPMIS into several modular

processes divided among the responsible commands may provide some solutions. Only after specific responsibilities are agreed upon and inter-organizational issues are identified and resolved, can we expect to improve the quality of the IMAPMIS data and processes.

As has been repeatedly observed, IMAPMIS is an unreliable, cumbersome and generally unsatisfactory conglomeration of programs and systems. Data and information, frequently reported incorrectly, are used by managers of the Naval Reserve and external organizations to evaluate the status of the force and to determine future directions and policies. Moreover, the applications do not lend themselves to modification or enhancement and more they do not support the requirements of either CNRF or NRPC.

IMAPMIS, a result of automating manual processes and data collection, was not intended to and, in its present form, cannot provide the managerial support required by either NRPC or CNRF.

In spite of these inadequacies, IMAPMIS is still the official repository of data concerning the Inactive Naval Reserve. The objectives of IMAPMIS redesign, as formulated in the early 1980s and listed below, were to correct these very problems. IMAPMIS redesign was intended to:

1. Support inactive reserve information requirements with valid, accurate and timely manpower information

2. Provide personnel and authorization data for screening and assigning personnel for mobilization

3. Provide an automated assist in structuring billet authorizations into reserve units

4. Respond to mobilization requirements promptly

5. Record officer and enlisted reserve participation data

6. Provide effective and efficient exchange of data between active and inactive personnel files

7. Provide personnel data for inactive reserve member promotion board support

However, throughout the redesign effort (1981-1990), IMAPMIS functionality has remained stagnant. Not one goal of the SDP I has been achieved, and there has been significantly little progress toward any of the seven objectives.

Projections for the redesign of IMAPMIS estimated a total life cycle of seven years at a cost of $ 21,773,000 and a completion milestone for phase one in March 1985 (IMAPMIS SDP I,1983). Actual spending data for phase I is not available, however figures for the period of fiscal years 1983 through 1986 reflect cost overruns of approximately 1,371,000. After nine years, two years longer than the entire projected life cycle of all three phases of the development effort, IMAPMIS

is still a long way from meeting the requirements specified in 1981. The project, as typical of large systems, exceeded all cost projections and was embarrassingly years behind schedule.

Considering the reduction in military budgets and the congressional interest in over-budget, over-schedule ADP system development (HOR Report 101-121,July 1989), it is highly doubtful whether IMAPMIS will ever be able to meet all of its functional requirements. Although the core of IMAPMIS has successfully been transformed into a relational database, the data itself is wrought with errors. The centralized control policies and lack of interface between IMAPMIS system developers and end users also reflect traditional batch-oriented management philosophies that have created a virtual wall between users in the field and NRPC.

Meanwhile, throughout the transition from a flat file system to relational database, the functional requirements, including the need for management reports and ad hoc queries increased significantly. Due to the original design and poor documentation of IMAPMIS applications, they cannot be modified. Instead, each process must be individually examined, redesigned and rewritten to meet the current requirements within a database environment.

Within the redesign effort, the huge number of new processes needed to rectify these problems and the extended

period of time required to develop them are unacceptable. While all of the organizations that use IMAPMIS are aware of these inadequacies, until recently, there has been no alternative.

To continue with the status quo of IMAPMIS will adversely affect all aspects of the Naval Reserve, particularly OP-095 and CNRF in their ability to provide well-trained SELRES. Other alternatives should be examined before more resources are devoted to IMAPMIS. With the present emphasis on downsizing ADP systems and future probabilities of austere budget constraints, it is postulated that physically trans- ferring the SELRES database maintenance responsibilities from NRPC could provide a viable solution to all concerned. Since RSTARS and RTSS became operational, CNRF now has the technical and managerial capability to not only maintain this database, but also the ability to interface directly with other external systems such as NFC's PAYPERS and OPNAV's NMDAS. By removing this responsibility for SELRES data maintenance from NRPC, thousands of hand inputs per month could be eliminated. The resources of NRPC, being relieved of the tremendous responsibilities of maintaining the SELRES database could then be diverted to other crucial problems involving the remaining Naval Reserve database.

III. ISSUES CONCERNING FUTURE IMPROVEMENTS TO IMAPMIS

In this chapter, management-related issues concerning information systems and how they relate to the problems and shortcomings of IMAPMIS will be addressed. Organizational issues, centralization/decentralization concerns, disputes over data ownership, problems of data quality and control and finally system interface concerns will be discussed. These issues, each bearing significantly on the success of both NRPC and CNRF as organizations, exert a direct influence on the future of IMAPMIS and where SELRES database responsibilities belong.

A. ORGANIZATIONAL CONCERNS

The installation of the first commercial computer in 1952, became the beginning of a new age of information technology (IT). Since that time, IT has evolved rapidly, with computer hardware technology and processing capability improving at the rate of 30 to 40 percent each year. Microcomputers of the late 1980s surpass the processing capabilities of the IBM 370 mainframe series of the early 1970s.

Today, with the availability of vast amounts of data and relatively low cost equipment, information is becoming increasingly important to the success of organizations. Due

to its expanded significance, information is widely being considered a valuable strategic resource. Its importance in achieving organizational objectives is regarded equally with personnel and financial assets.

The goal of organizations today, and the Navy is no exception, is to use information and information resources to achieve the greatest possible gain in mission effectiveness. However, in order to achieve this goal, plans for information systems development and usage must be aligned with strategic command objectives. Use of systems that do not support these goals will, in all likelihood, prove counterproductive to the command. Implementation of new technologies will provide better methods of accomplishing mission needs only if the long range information and data needs of the command are understood and systems are developed accordingly. The alternative courses of action that result from these plans may lead to changes in organizational structures and relationships in order to better realize advantages of new information opportunities (DOD (MPT),June 1987,p.5). Restated, organizations should:

> ...base decisions regarding the need for new or improved automated information systems on a careful analysis of the current organizational functions and the ways that information systems are currently supporting them, and what is needed to make the organization (as a whole) more effective in accomplishing its goals. (DCNO (MPT),July 1987,p.iii)

Designed to automate clerical functions and collect data, IMAPMIS was developed in support of NRPC's predominantly administrative organizational mission. Its primary function was, and is today, to support an efficient, effective mobilization of reserve assets by maintaining an accurate, comprehensive collection of information about members of the Inactive Naval Reserve.

However, many of these reservists, the SELRES fall under the direct operational control of CNRF. The CNRF mission is to structure mobilization billets into effective and efficient units and subsequently train and administer SELRES that will fill those billets. Dependent on IMAPMIS as his source system, CNRF is vitally interested in the way that IMAPMIS is managed, its responsiveness to his mission, and how future application development decisions are made. Information is of strategic importance and essential for CNRF's future success in a climate of shrinking budgets and increasing pressures for improved performance. Yet, IMAPMIS is administered and controlled by an organization that is not only external to CNRF, but is not even within the chain of command. CNRF is not receiving adequate support from IMAPMIS and further, has absolutely no control over decisions regarding the future of IMAPMIS and data critical to mission accomplishment.

Thus, two highly disparate organizations with entirely different goals, must rely on a common database and processing system for support. At some point in the near future, it must be recognized that IMAPMIS cannot effectively support both of these incongruous missions simultaneously. Therefore, each command should closely examine and redefine its own internal information requirements and proceed with appropriate actions to accomplish them.

This reexamination of the future of IMAPMIS and its ability to support both NRPC and CNRF missions involves a highly political issue of control. To be truly effective, the database and associated applications should more accurately reflect the attitudes, policies and goals that influence all aspects of CNRF. Without CNRF being able to exert any influence over these issues, IMAPMIS will continue to operate independently of this primary user. A recent study to combine the ADP application developments of both CNRF and NRPC into a single echelon three command that would act as a centralized design agency would finally allow input from the CNRF perspective and should be adopted.

B. CENTRALIZATION/DECENTRALIZATION ISSUES

Historically, management of information systems was centralized to enhance processing efficiency and enforce organizational policies. Applications were batch-oriented and

not easily distributed. With the rapid expansion of technology over the last decade, the demand for information increased. If users could not get responsive results from ADP departments, microcomputers were obtained for local use, circumventing centralized systems. This also created problems as control of data and policies was lost and islands of information developed. Data and applications proliferated, with little, if any, control or standardization. In the last few years, CNRF has experienced this dilemma of controlling end user computing and has now focused the use of microcomputers into building a distributed SELRES database that employs data structures and definitions established within the new IMAPMIS database. By incorporating information planning into the organization's long range goals, CNRF has directly confronted both organizational and centralization/decentralization issues. With foresight and resourcefulness, CNRF developed RTSS and RSTARS, a framework that provides CNRF with centralized strategic control of a large integrated information system and also offers geographic distribution of data entry and processing to operational levels (the NRAs). RTSS gives CNRF demonstrated capability to maintain a centralized master database. RSTARS affords commanding officers access to and the ability to update and manipulate critical SELRES and mobilization data on a daily basis using replicated partitions of the master database.

Although this approach may not be the most efficient method of data storage, it does successfully support the information needs of CNRF. Data is input at the NRAs on a daily basis and uploaded nightly to CNRF via modem. Once inputs are processed, the master database in New Orleans is the most current, most accurate database pertaining to SELRES and mobilization billet structures. Additionally, this distribution solution affords a maximum level of backup capability in the event of a loss of the master database. Other factors, such as cost of communications and methods of update are the most efficient and effective possible given the equipment and budgets available.

While the centralized management and control approach of IMAPMIS ideally supports the administrative, record-keeping mission of NRPC, it is unacceptable for the needs of CNRF. The decentralized, distributed structure of RTSS and RSTARS more adequately supports the operational requirements of CNRF.

C. DATA OWNERSHIP

The central question still remains unanswered: who really owns the SELRES data? Is it NRPC, tasked with maintaining the records for all inactive assets, or is it CNRF who actively uses and manipulates both personnel and mobilization billet data.

In the early days of computerized data processing, most systems were clerical in nature. Input, processing, output and storage functions were all the centralized responsibility of a single department. In this environment, the commonly accepted belief was that the data was "owned" by the application by which it was used. The department that developed these applications used them to justify budgets. Subsequently, since the ADP department paid for the system, they owned the data.

However, with the introduction of database systems, data is now totally independent of the applications. Data is accessible by multiple systems and multiple users. Logically, in a database environment, ownership refers instead to the accountability of an individual for each data element. The task of assigning ownership of data within an organization is normally coordinated by the database administrator among the various users. However, since IMAPMIS is external to the true users of the data, there is little coordination between the users and NRPC. Therefore, there are no clearly defined responsibilities for data control exist.

For example, CNRF is responsible to the Chief of Naval Operations for structuring mobilization billets and for training and administering SELRES. To effectively accomplish these objectives, CNRF must have a reliable, accessible and responsive database available for daily transactions and use

in formulating management decisions. Alternatively, IMAPMIS merely reports information and processes updates submitted by CNRF. In many cases, data submissions by CNRF are not accurately updated within IMAPMIS (CNRF letter,7 November 1989). Does CNRF own the data or does NRPC? The answer depends entirely on who is asked. Surprisingly however, within the present IMAPMIS system architecture, CNRF has virtually no control of the data or data quality that directly affects the personnel resources he is responsible for training.

D. DATA QUALITY

Data quality can be viewed in many different perspectives. These encompass data integrity (or accuracy), completeness, timeliness and currency, and origin. Data integrity is perceived as a joint responsibility between the users, for actual contents and values, and the database administrator, for logical data structures (Perry,1983,p.28). Control of lata integrity has historically been a constant source of irritation between CNRF and NRPC. For SELRES assigned to reserve units, quality data represents timely, accurate compensation for performed training. For CNRF it provides comprehensive, precise information about unit billet structures and the associated manning and training levels of assigned personnel. These attributes are sorely lacking

within IMAPMIS, which seriously restricts the ability of CNRF to achieve assigned goals.

One major difficulty in assessing accuracy of data within IMAPMIS is that it is not clear how all of the data is collected or input or which source of data dominates others. With the numerous interorganizational interfaces of IMAPMIS and the volumes of input and output tapes used in processing, it is virtually impossible to determine which system overrides which and ultimately ascertain data origins. The data contained in the IMAPMIS database is full of errors and in many cases incomplete.

A second problem, involves error detection. The lapse of time between data entry and error detection, has a direct the complexity of data correction. If errors are detected at the point of entry by built in edit checks and validation, then the probability of correction is very high. Conversely, if errors are not found for several weeks, minimal effort and time will be devoted to corrections (Davis and Olson,1985). Thus, the amount of time taken to identify errors seriously affects the data quality. In IMAPMIS, where errors may go undetected for weeks or even months, data quality problems abound and will not, in all likelihood, improve.

A third major problem in IMAPMIS is the result of a complete lack of enforceable standards of data quality for governmental information systems. Most directives and

instructions are vague and ambiguous (Laudon,January 1986). Without adequate guidelines for specifying data quality, that quality becomes difficult to define and even more difficult to enforce. Further, as long as IMAPMIS remains a large centralized database with multiple overlapping processes, control of data quality will continue to elude system managers no matter how good the data quality is at the point of entry.

Most authorities on database quality agree that data should be captured and entered into any information system at its source. The question then becomes, what is the proper source of data. It is the contention of this thesis, that the best source of data for an individual SELRES is the NRA where the member drills. Similarly, the authoritative origin of unit structures should come from CNRF and not be overturned by IMAPMIS edits. Therefore, the data being input to IMAPMIS at the NRAs and through RTSS is in fact, the most recent, accurate data available. Further, this data, once validated by entry edit checks should be considered by all other systems as the data against which other data elements should be compared and updated. Presently, the system operates exactly the opposite with newly input data from the NRAs being compared to data already in the IMAPMIS database.

The validation and edit checks completed at entry and at the CNRF level are sufficient to ensure that data is correctly updated. As the users "are made responsible for entering

their own data and for the accuracy of those data, the number of errors drops greatly..." (Martin,1981). Data entry, performed by local personnelmen or civilians who understand what the data means, will also help ensure the completeness and timeliness of the data and subsequently improve the accuracy and quality of the master database. Although these functions are being accomplished now at the NRAs, IMAPMIS interface edits that create high volumes of transaction rejections only serve to intensify the adversarial relationship between CNRF and NRPC. This is usually reflected in the attitude that "It's not my fault that things are screwed up: the computer did it".

E. DATA AND SYSTEM INTERFACES/INTEROPERABILITY CONCERNS

Interoperability is the ability to share resources through planned compatibility of technical resources; and further to use these capabilities to support functional requirements in the most effective and cost efficient manner possible (OPNAVINST 5230.22,6 October 1986).

> It is extremely important that, in exchanges of automated data, the one receiving the data has the same interpretation as the one sending it. This understanding is directly related to the definition of the data elements and the values of the data codes. (DOD 500.12-M,October 1985,p.5)

Due to original design of IMAPMIS and poor documentation, the numerous internal and external system interfaces are ill-defined. As previously discussed, in CNRF correspondence to

CNRF (CNRF letter,14 November 1989) the immediate need to correct these interface problems was fervently reiterated. SDP III also recognized the necessity for the upgrade of system and process interfaces. Although major efforts have been dedicated within the Navy to develop standardized data definitions and structures, those incorporated into the many IMAPMIS subsystems have not yet been updated, and may or may not conform to these standards.

With these problems in mind, it is easy to understand the antagonism between IMAPMIS program administrators and the data users. For the users, who are trying to maintain a quality database, it is frustrating to explain to a SELRES that he/she will not be paid for their previous drills because a hidden edit within IMAPMIS has rejected a valid transaction. No one seems to have a firm understanding of which system overrides another or who is ultimately responsible.

F. LEGAL CONSIDERATIONS

In addition to the operational issues addressed above, there are also legal ramifications to the present state of IMAPMIS. The Privacy Act of 1974 imposed a legal obligation that all computerized record systems must:

> ...maintain all records which are used by the agency in making any determination about any individual with such accuracy relevance, timeliness and completeness as is reasonably necessary to assure fairness to the individual... (P. L. 93-579: The Privacy Act of 1974)

Thus, information systems containing inaccurate, incomplete, ambiguous information not only violate individual's rights, they are technically illegal.

G. SUMMARY

The problem within IMAPMIS then becomes one of how to best resolve both management issues and the operational inadequacies. Constant struggles at CNRF to control the data quality and ensure compliance with applicable statutes are met with resistance at NRPC. IMAPMIS developers, concentrating on administrative problems are occupied with an almost insurmountable challenge of transitioning IMAPMIS into a modern, responsive system. Under existing centralized management control policies and focus on NRPC mission objectives, CNRF will not receive any relief in the foreseeable future. Alternatives must be examined that will support the future needs of **both** CNRF and NRPC. These needs should be pursued independently with NRPC continuing with IMAPMIS redesign emphasis on non-SELRES applications; and that CNRF forge on with expansion of RTSS and RSTARS, assuming management responsibility of the mobilization billet and SELRES database.

In the following chapter, a revised data flow architecture will be proposed that will provide a faster, more reliable alternative to awaiting future improvements to IMAPMIS. These

enhancements, that will surely be insufficient for CNRF information needs are a classic case of too little, too late. The feasibility of establishing the SELRES database at CNRF and the emergent data flows it creates will be discussed.

IV. RECOMMENDED DATAFLOW ARCHITECTURE

It is common knowledge within the Naval Reserve Force that
IMAPMIS is incapable of supporting the current information
needs of CNRF. In fact, as far back as 1983 system planners
wrote that:

> The redesign and rewrite of IMAPMIS is the most compelling
> need of all Inactive Requirements as the present system
> is the basic cause of numerous problems cited daily by
> users at all levels. (IMAPMIS SDP I,1983)

Since little has changed, it is now time to consider
significant changes to the way SELRES data is controlled and
processed.

In regard to the inadequacies of IMAPMIS discussed in the
previous chapters, it is strongly recommended that maintenance
responsibility for the SELRES and Mobilization Billet database
be removed from IMAPMIS/NRPC management and transferred to
CNRF control. As has been previously mentioned, however,
IMAPMIS is and will continue to be, under the auspices of
NMPC, the official corporate repository for all Inactive
Reserve data. Therefore, through the RTSS/IMAPMIS interface
and PAYPERS processing, the CNRF database will continue to
feed periodic data updates to IMAPMIS to satisfy currency and
external reporting requirements. This approach will
successfully support improved data quality for both CNRF and

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IMAPMIS, minimize the need for changes in system interfaces, promote modular management information application development, and provide the information system structures that best suit both CNRF and NRPC.

In this chapter, the actual changes in data flows that result from the new architecture as well as each of the improvements mentioned above will be discussed.

A. CHANGES IN INFORMATION DATA FLOWS

The information flows that existed in IMAPMIS prior to the introduction of RSTARS and the direct interface between NMDAS and RTSS are provided in Figure 5. Even with these improvements, many of the old data flows continued to exist as NRAs began using RSTARS and discontinued submission of diary entries directly to NRPC for input to IMAPMIS. Additionally, although RTSS is scheduled to receive billet data from OPNAV, CNRF must still submit hardcopy unit structures to NRPC for input to IMAPMIS for production of official unit manning and readiness reports.

As can be noted from Figure 5, the number of organizations and internal and external systems that input data directly to NRPC imposed a tremendous burden on personnel and the system interfaces. With 419 NRAs submitting personnel and drill data on approximately 131,000 SELRES in addition to non-SELRES data requirements, both NRPC and IMAPMIS struggled to sustain
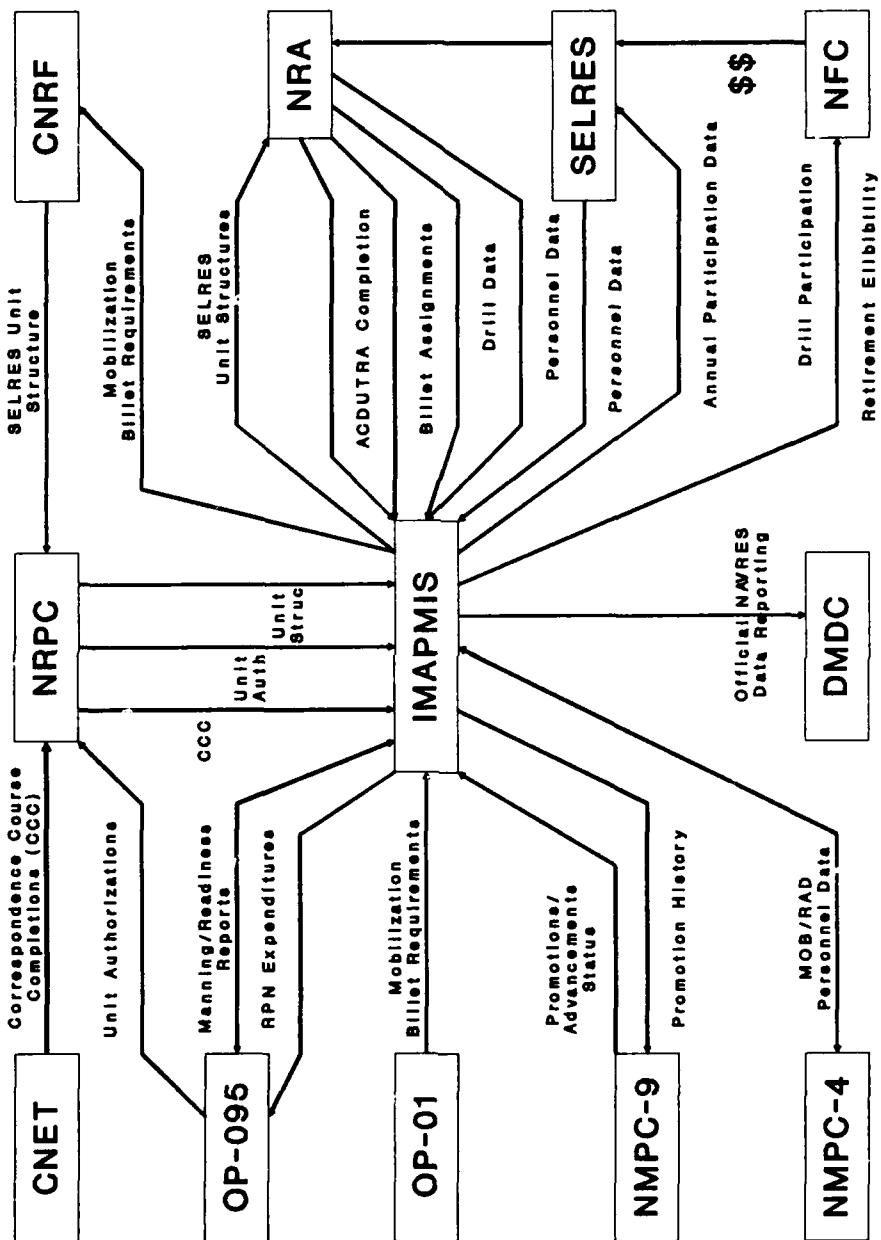
EXISTING SELRES DATA FLOW ARCHITECTURE

Figure 5.   Existing SELRES Data Flow Architecture

existing levels of quality. Additionally, Figure 5 suggests the tremendous amount of data that was merely passed from one source to another with little processing. Specific examples include:

1. The passage of unit structures from CNRF to NRPC for input into IMAPMIS. Once input, unit reports were generated and forwarded to the NRAs

2. Personnel data, billet assignments, and drill participation data were submitted to NRPC. Drill chits and paper OCR documents were scanned to generate data tapes that were forwarded for processing with IMAPMIS updates

3. Unit authorizations from Director of Naval Reserve were sent to NRPC to either establish or discontinue reserve units. The information was input to IMAPMIS by NRPC personnel

4. ACDUTRA completion data was also passed to NRPC from PSDs for input to IMAPMIS and eventual update of participation point credit

These are only a few of the examples of data passing and the volume of transactions that were imposed on the NRPC staff.

Figure 6 illustrates a revised information flow architecture with full implementation of the NMDAS-RTSS
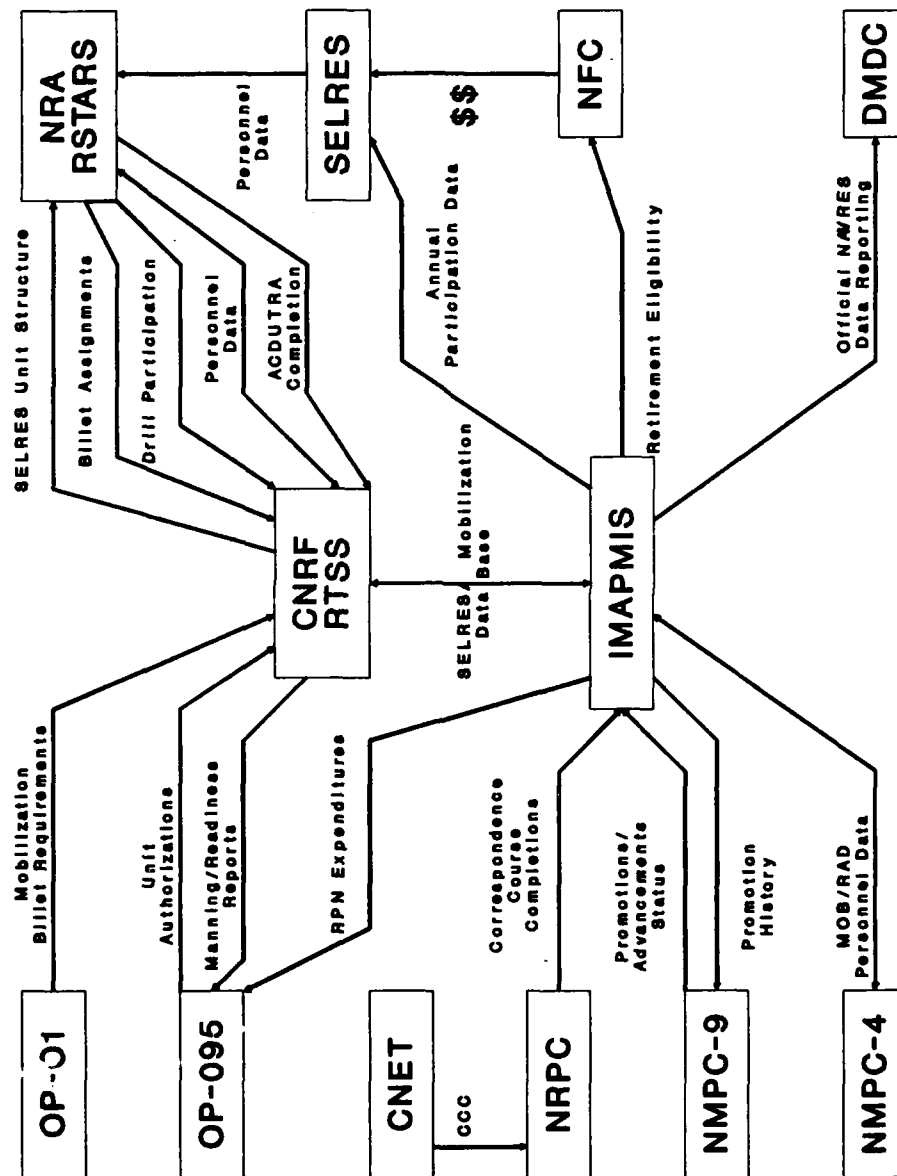
REVISED SELRES DATA FLOW ARCHITECTURE

Figure 6.   Revised SELRES Data Flow Architecture

interface and transfer of the SELRES/Mobilization database to CNRF responsibility. This simplified data flow will allow field activities to submit all personnel, billet assignments, drill participation and ACDUTRA data electronically to the central CNRF/RTSS database. Adequate validity and edit checks are incorporated at both the NRA and the CNRF level to ensure that data elements are correct and correspond to acceptable values and structures. Since data uploads and downloads are accomplished on a daily basis between each NRA and CNRF, the database is up-to-date and accurate within a 24-hour period. Data is no longer simply passed among commands awaiting entry or processing.

B. CNRF MANAGEMENT CONCERNS

The transition of a flat-file system to database technology is not merely a change in applications, it requires a change in management philosophy. CNRF has recognized the value of information as a strategic resource and has incorporated it into command long-term objectives. In recent years, with the development of RTSS and RSTARS, CNRF has established a distributed information system that supports commanding officers in the field with local SELRES and mobilization billet data as well as proving a centrally controlled database that is accessible and accurate. With

these resources totally under CNRF control, more effective and efficient decisions regarding mission accomplishment.

C. APPLICATION DEVELOPMENT AND MANAGEMENT INFORMATION APPLICATIONS

Some of the major objectives of using database technology are to speed up application development, generate better documentation, and reduce application maintenance costs. Applications for the RTSS/RSTARS systems are being developed in a modular approach and using higher level languages that simultaneously support navy directives and also significantly reduce development time and costs through the use of prototyping.

Future applications will also include management support programs, to include decision support systems (DSS), that will enhance the ability of CNRF to more effectively and efficiently use limited resources to achieve major operational goals.

D. SYSTEM INTERFACES

The only interfaces that will change among the many organizations and systems with the revised information flow, will be the establishment of a direct link capability between RTSS and PAYPERS. By initiating this interface, RTSS data can be transmitted directly to PAYPERS for processing against

and with IMAPMIS tapes. This interface eliminates the need to hand-carry data tapes to NRPC who must then schedule the bulk data transfers using EPMAC facilities.

With the already existent capability to download billet requirement data from NMDAS, no new interfaces need be established with OPNAV. This interface, which became effective in October 1989, has proven beneficial in both enhancing timeliness in receiving updated mobilization requirements and the ability of CNRF to more quickly structure reserve units.

The interface between RTSS and IMAPMIS already exists and should not change other than to correct edit and validation problems that have already been identified. Even though the SELRES data may be controlled by CNRF, it is still vital that the data be transmitted to the NRPC data repository.

In the future, it will no longer be necessary for NRPC to receive an enlisted or officer service record in house and a member record be established before the member can be affiliated in the Naval Reserve. New member information can be verified on the PAYPERS system during processing to ensure that the individual was a loss to active duty and to preclude allowing an individual to affiliate with more than one service. After this verification is complete, the member should be eligible for participation and pay.

E. BUNDLED TRANSACTIONS

In regards to bundled transactions, RTSS development efforts should attempt to design an application modification that will accept a single entry, such as an advancement or unit transfer, and automatically generate the prerequisite entry for discharge or detachment from a previous unit. This will eliminate the need for dual entries to accomplish a single personnel change. If it is possible to tie the generated entry with the original entry, this may also alleviate the parallel processing problems encountered with the PAYPERS hardware suite.

F. DATA OWNERSHIP AND IMPROVED DATA QUALITY

As discussed in chapter four, in order to enhance data quality, data should be entered at its source, and personnel who input the data should be held directly responsible for the quality. Today, the accuracy and quality of the CNRF database on SELRES is far superior to that of the database maintained by NRPC. Once the data flow architecture is revised, the data quality of IMAPMIS becomes the sole responsibility of CNRF. The data then should become the standard against which other data is compared and updated as necessary. No longer will the tail be wagging the dog, but the accurate SELRES data will update IMAPMIS. From the perspective of CNRF, there will be little change in business with the exception that, when a

correct and valid data entry is put into the database, there should be no external interface or processing requirement that will reject the transaction. Thus, in addition to betterment in CNRF performance and decision quality, there should be significant improvements in data reported to external sources. This will ultimately precipitate better policy and budget decisions in behalf of the Naval Reserve Force.

G. SUMMARY

In summary, by transferring the SELRES/Mobilization Billet database to CNRF control, many of the management issues previously addressed and the operational problems of IMAPMIS will be circumvented. NRPC program developers can then concentrate their future application efforts to those processes and interfaces that directly impact on the management of non-SELRES personnel.

In chapter five, a brief summary of the inherent problems of IMAPMIS will be given, and followed by a synopsis of the effects that the revised information flow architecture will have on resolving these problems.

V. CONCLUSIONS

Despite the fact that IMAPMIS is an antiquated system full of errors and unresponsive to either CNRF or NRPC information requirements, NRPC is still responsible for maintaining the Navy's corporate Inactive Naval Reserve database. The original design and applications of IMAPMIS cannot be modified to efficiently support the new relational database. Therefore, all applications and interfaces must be carefully examined, evaluated and redesigned before any improvements will be noticeable. Further, the differences in organizational goals of NRPC and CNRF provide little common ground for future agreement on priorities for improvements or uses of IMAPMIS.

To compensate for the poor support of IMAPMIS, and in an attempt to provide some internal command controls, CNRF developed his own database to more closely suit strategic and operational information requirements. Although this system (RTSS) is highly effective and used throughout the Naval Reserve Force, it still has not been permitted to solve any of the basic management and quality problems inherent to IMAPMIS. RTSS and RSTARS, the only data input sources for SELRES data were designed to control data redundancy, and ensure the timeliness and completeness of data. Even with

CNRF achievements in maintaining an accurate database, frequent IMAPMIS data overwrites and transaction rejections generated by antiquated edit and validity checks prove counterproductive. Sources of transaction rejections are virtually impossible to isolate and continue to hinder relationships between CNRF and NRPC.

Without control of SELRES data, CNRF has failed to positively affect the quality of IMAPMIS. However, major innovative improvements have resulted from the development of RTSS and RSTARS. During the same time-frame as phase one of IMAPMIS, CNRF introduced microcomputers to NRAs and during the last year, has successfully transitioned from the archaic, time-consuming practice of updating SELRES data with OCR documents mailed to NRPC for scanning, to modern interactive data update and electronic data transfer capabilities. With the advantage of being able to design a **new** system rather than being constrained by trying to redesign an old system, CNRF was able to use a modern, modular development approach. The result is a highly successful, state of the art, distributed data system that is easy to use and update. The use of high level languages and incorporation of microcomputers into the overall system architecture has earned widespread acceptance. Use of application generators for module development has enhanced documentation and ensured lower cost, more easily maintained applications. Additionally, RTSS and RSTARS lend

themselves to future management information applications including decision support systems (DSS) similar to that under development for mobilization billet structuring.

This proposal, to extract the SELRES and mobilization billet database from NRPC responsibility, and to use the CNRF database to update NRPC records, is a preferred solution to many IMAPMIS-related problems. Data quality will certainly improve and responsibilities and accountability are clearly defined. CNRF will be able to access accurate data for analysis and support of internal management decisions. And finally, data reported by IMAPMIS to external sources will more accurately reflect the true status of the Naval Reserve Force and will support improved policy and budget decisions in the future.

APPENDIX A

GLOSSARY

ACCPDS   Active Component Common Personnel Data System (DOD)

CDC   Consolidated Data Center

DMDC   Defense Manpower Data Center

EMF   Enlisted Master File (NMPC)

EPMAC   Enlisted Personnel Manpower Center (NMPC)

FAD   Foreign Address File (NRPC)

IEMF   Inactive Enlisted Master File (NRPC)

IFILMAN   Inactive File Maintenance (System) (NRPC)

IMAPMIS   Inactive Manpower and Personnel Management Information System (NMPC/NRPC)

IOMF   Inactive Officer Master File (NRPC)

IOPAS   Inactive Officer Promotion Administrative System (NMPC)

IRIS   Inactive Remote Inquiry System (NRPC)

MAD   Master Address File (US Postal Service)

MANTIS   Programming Language used with CINCOM's SUPRA

MAPTIS   Manpower and Personnel Training Information System

NEOPS   Navy Enlisted/Officer Participation System (NRPC)

NES   Navy Enlisted System (NMPC)

NMDAS   Navy Manpower Data Accounting System (OPNAV)

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GLOSSARY (cont.)

NRPDS   Naval Reserve Drill Pay System (NRPC)

NRURS   Naval Reserve Unit Reporting System (NRPC)

OMF   Officer Master File (OMF)

OPINS   Officer Personnel Information System (NMPC)

PERSPAY   Personnel and Payroll System

PH-PI   Promotional History Transaction

PIMMS   Pretrained Individual Manpower Management System
            (NRPC)

RCCPDS   Reserve Component Common Personnel Data System
            (DOD)

RESFIRST   Reserve Field Information Reporting System (NRPC)

RESFMS   Reserve Financial Management System (NRPC)

RTSS   Reserve Training Support System (CNRF)

RUAD   Reserve Unit Assigned Document

RUMAS   Reserve Unit Manpower Authorization System (NRPC)

SDS   Source Data System (NMPC)

LIST OF REFERENCES

Benoit,Paul S.,"Handling Rejected Input Transactions,"_Journal of Systems Management_,pp.26-28,May 1979.

Chief of Naval Operations (OPNAV) Instruction 5230.22,Subject: Manpower Personnel Training (MPT) Information Resource Management (IRM) Program,6 October 1986.

Davis, Gordon B., and Olson, Margrethe H.,_Management Information Systems Conceptual Foundations, Structures and Development_,2d ed.,McGraw-Hill,1985.

Department of Defense (DOD) Instruction 5000.12-M,Subject: DOD Manual for Standard Data Elements,October 1986.

Deputy Chief of Naval Operations (DCNO) for Manpower Personnel Training (MPT) Publication OPNAV P162-G1-87,Subject: Technical Architecture Planning Guidelines,June 1987.

Deputy Chief of Naval Operations (DCNO) for Manpower Personnel Training (MPT) Publication OPNAV P160-S6-87,Subject: Manpower Personnel Training (MPT) Program Life Cycle Management (LCM) Standard,July 1987.

House of Representatives Report 101-121,Subject: Report of the Committee on Armed Services House of Representatives on H.R. 2461 Together with Additional Dissenting Views,1 July 1989.

Laudon,K.,"Managing Interorganizational Record Systems," _Communications of the ACM_,v.29,No. 1,pp.4-11,January 1986.

Martin, James,_Design and Strategy for Distributed Data Processing_,,Prentice-Hall, Inc.,1981.

Naval Military Personnel Command Memorandum NMPC-92:dt,Subject: Mission Element Need Statement; submission of,15 July 1981

Naval Reserve Force Letter 5230 Ser 104/558 to Commanding Officer, Naval Reserve Personnel Center,Subject: Billet Data Accuracy,7 November 1989.

LIST OF REFERENCES (cont.)

Naval Reserve Force letter 5230 Ser 104/564 to Commanding Officer, Naval Reserve Personnel Center,Subject: Inactive Manpower and Personnel Management Information System (IMAPMIS)/Reserve Training Support System (Technical Enhancement) (RTSS(TE)) Interface Analysis,14 November 1989.

Naval Reserve Force Letter 5230 Ser 104 to Commanding Officer Navy Finance Center (Code 62),Subject: Reserve Pay,10 November 1989.

Naval Military Personnel Command Letter NMPC-92:JPE:kz to Director, Total Force Automated Systems Department (NMPC-16),Subject: Forwarding of IMAPMIS Redesign System Decision Paper (SDP-I) for approval,7 January 1983.

Naval Reserve Personnel Center Letter 5230 Serial 60/1652 to Commander, Naval Military Personnel Command (NMPC-165), Subject: Inactive Manpower and Personnel Management Information System (IMAPMIS) Redesign Life Cycle Management Documentation,22 September 1989.

Perry, William E., _Ensuring Database Integrity_,John Wiley & Sons,1983.

Public Law 93-579 : The Privacy Act of 1974,Section 3,[e] and [6].

Schwartz, Karen D., "Naval Reserve Automates a Command by Section," _DOD Computing_,2 October 1989,pp.49-50.

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